Monetary Policy Responses to the 2008 Financial Crisis: Quantitative Easing Evidence in the United Kingdom

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Abstract

This paper analyzes responses to monetary policy tools during the United Kingdom's Quantitative Easing regime from March 06, 2009 to June 02, 2010 on a set of target variables: market index, foreign exchange index, investment grade and non-investment grade bond yield, and spots and forwards of different maturities for OIS, LIBOR and Nominal Government Yield. Results suggest that conventional monetary policy tools other than a zero-bound official bank rate may still be effective. Inclusion of one unconventional tool, the increase in government gilt holdings, has significant impact on most of the target variables.

JEL Key words: General Financial Markets, Financial Institutions and Services, Bond Interest Rates

JEL codes : G100, G280, G120

I. Introduction

Quantitative Easing refers to an expansionary monetary policy regime where a monetary authority is actively involved in large-scale asset purchase programs in order to inject additional liquidity into the economy as the official bank rate becomes an insignificant monetary tool because it has been reduced to a threshold level at or close to zero. During such policy regimes, asset purchase programs may engage a wide variety of financial assets from government short term treasuries and short term commercial paper and CDs to long term corporate bonds and government treasury notes and bonds.

Recently, Japan was one of the developed economies that pursued a similar policy as the overnight lending rate reached the effective lowest bound of zero rates in February 1999. In March 2001, the Bank of Japan decided to supplement the zero-rate policy with a Quantitative Easing policy to provide further stimulus to the economy as price levels kept falling. The recent global financial crisis following the Lehman Brothers collapse in September 2008 forced monetary authorities in most countries around the world to initiate active monetary responses to stabilize the financial markets and support aggregate demand. (See Klyuev et al (2009).

In this paper, we discuss Quantitative Easing (QE) monetary policy responses in the United Kingdom during the period of August 01, 2008 to June 02, 2010. We analyze how the conventional monetary policy tools—narrow money, broad money, and official bank rates—may impact financial markets and term structure during three sample periods; a) Overall Sample Period from 08/01/2008 to 06/02/2010, b) Pre-Quantitative Easing Period from 08/01/2008 to 03/05/2009, and c) Quantitative Easing Period from 03/06/2009 to 06/02/2010. Later we focus on analyzing the impact of non-conventional monetary policy tools—increasing the Central Bank asset-base through Gilt purchase and corporate bond sales and purchases—on increasing inflation expectations during the QE period.

We contribute to existing literature on monetary policy transmission in three different ways. First, we provide empirical evidence on monetary policy by using the United Kingdom dataset compared to the Japanese zero-bound interest rate literature. Second, we differentiate between monetary policy

regimes for the pre-quantitative easing period and the quantitative easing period by dividing the sample period. Third, we include a large cross-section of different maturities of interest rates to analyze whether a long-run equilibrium or steady state exists between monetary policy tools and target variables. We follow the approach of Pedroni (2004) who presents a thorough discussion of issues in dealing with short time series variables and illustrates that, in the absence of any alternative to extend the time series, allowing more cross-sectional data may solve the short time span problem of structural co-integration tests.

The paper begins with a brief discussion of the existing literature on Quantitative Easing followed by a description of the dataset and research methodology in Section Two. Section Three elaborates on the descriptive statistics and then presents results from simple OLS regressions for different term structures. Section Three presents analysis on the time series properties of the variables, their autocorrelation structure and unit root features, and provides a plausible explanation of long-run equilibrium across various panels of forward and spot rates by using the Pedroni (2004) Panel Co-integration technique. Finally, Section Four summarizes the key empirical findings.

1.1 Literature Review

Although the Japanese experience of Quantitative Easing is most frequently cited in the literature, evidence of Quantitative Easing can be traced back as early as 1932 in the U.S. when the U.S. Federal Reserve initiated a $1 billion purchase of government treasuries and maintained it until 1936 to mitigate deflationary trends during the Great Depression. However, the monetary impact of Quantitative Easing regimes is still a debated issue.

Recent studies in the Quantitative Easing literature focus on the Japanese experience beginning in February 1999 as the official bank rate effectively reached the zero-bound threshold. To provide further stimulus to the economy and avoid a deflationary trend, the Bank of Japan undertook Quantitative Easing as a supplement to its zero-rate policy in March 2001. Shirakawa (2002) discusses the Japanese experience of Quantitative Easing and delineates possible transmission channels of monetary policy during a zero-bound interest regime. He notes the similarity of the Japanese experience to the experiences

of Sweden and the U.S. in the early 1930s. More recently, Shiratsuka (2010) compares the Quantitative Easing policy of the Bank of Japan during 2001 to 2006 to the U.S. Federal Reserve's policy. The U.S. Federal Reserve policy reactions aim at the asset side of its balance sheet whereas the Bank of Japan focuses on a target for the current account balances on the liability side.

Gauti and Woodford (2004) analyze the possible impact of Quantitative Easing as a supplement to a zero interest rate regime in a Neo- Keynesian framework. They argue that QE may fail to inject the desired level of stimulus to an economy if central bank policy cannot change expectations about future policy. That is, to ensure the desired effect, the central bank needs to make an explicit commitment about the future policy and such commitment needs to be credible. However, their interpretation is different from Auerbach and Obstfeld (2003) although both models are based on a similar framework. Unlike Gauti and Woodford (2004), Auerbach and Obstfeld (2003) assume that open-market operations may permanently increase the monetary base.

Later, Bernanke (2004) draws from the Japanese experience and discusses three monetary policy alternatives during a zero-interest regime that can provide additional stimulus to an economy. First, the central bank can provide assurances that short-term rates will be kept lower in the future, to influence investor expectations. Second, a monetary authority may change relative supply through open market operations. Third, by increasing its balance sheet (QE), the central bank may keep the short-term rates at the zero-bound. Bernanke (2004) concludes that credibility of monetary policy will be pivotal in such policy regimes.

More recently, Klyuev et al (2009) elaborate on four possible alternative monetary actions central banks may take during a zero rate period, namely a) making an explicit commitment to maintain low policy rates, b) providing additional liquidity to financial institutions, c) affecting the long-term interest rates by purchasing government securities (QE), and d) actively intervening in specific credit markets. However, the impact of central bank actions may not be obvious because monetary transmission to the

economy is complex. Later, Joyce et al. (2010) perform one of the few studies to analyze a Quantitative Easing experience other than Japan's. They analyze the impact of gilt purchases by the Bank of England on long-term interest rates by using multivariate GARCH model. More recently, Ashraf et al. (2015) analyzes the QE experience in the United States and investigates the impact of unconventional monetary tools on the stock market reaction, with specific reference to the financial institutions.

This paper aims at providing empirical evidence to the much debated issue of the efficiency of conventional monetary policy tools during zero-bound official fund rate regimes. It also addresses another important research issue relevant to the existing literature, namely how unconventional policy tools such as asset purchase programs may impact the target interest rates vis-à-vis term structures.

II. Data & Methodology

2.1 Data

Data on the United Kingdom's monetary policy tools, interest rate structure, and market returns are collected from the Bank of England's official website.[1] In general, information on monetary policy tools—broad money, narrow money (M1, M2 and M4), and Official Bank rates—stock market index, and exchange rate index are available from January 31, 2007 to June 30, 2010 on a daily frequency. The Bank of England dataset also provides daily information on spot and forward rates of Overnight Index Swap (OIS), LIBOR rates, and inflation curves for fifty different maturities ranging from 6 months to 25 years at six-month intervals.

Quantitative Easing regime asset purchase data are available following the formation of the Asset Purchase Facility Fund on January 30, 2009. Gilt purchase data are available on a ticker by ticker basis with offer prices and yield information from the first gilt purchase date on January 26, 2010 to March 11, 2011. Corporate bond purchase and sales data begin on March 25, 2009 and January 08, 2010

[1] Reference: http://www.bankofengland.co.uk/publications/events/QEConference/QEdataset.htm

respectively on a ticker by ticker basis with allocation volume and effective yield information. All yields are given in percentages and all monetary policy tools other than official bank rate, broad money, narrow money, Bank of England's gilt holdings, and gilts and bonds purchase and sales information are given in million sterling units.

2.2 Methodology

The existing literature cites conflicting arguments on the effectiveness of monetary policy during zero rate regimes. Bernanke (2004) argues that zero rate regimes may be effective if the central policy is credible and the central bank's commitment to maintaining short-term rates close to the zero-bound are made explicit. Klyuev et al (2009) note that impact of monetary responses may not be easily measureable. However, they also argue that unconventional policy tools may be used as effective ways to manage the balance sheet of the central bank and eventually affect the target rates.

The approach taken in this paper to analyze the impact of monetary policy on various target rates is consistent with the central bank balance sheet management argument cited by Klyuev et al (2009). As a proxy of central bank asset size and active participation in asset purchase programs, gilt holdings in the central bank balance sheet and purchase of gilt and net purchase of corporate bonds are considered unconventional policy tools. Conventional policy tools include various measures of broad money and narrow money (M1, M2 and M4) and the official bank rate.

As the Bank of England initiated its Asset Purchase program on March 06, 2009, our Quantitative Easing analysis specifically focuses on the analysis of monetary policy tools for the March 06, 2009 to June 02, 2010 period. However, for better comparison of monetary responses during Quantitative Easing and other regimes with an effective official bank rate of zero, a larger overall sample period of 08/01/2008 to 06/02/2010 is considered. Therefore, the following sample periods are considered: a) Overall Sample Period of 08/01/2008 to 06/02/2010, b) Pre-Quantitative Easing Period of 08/01/2008 to 03/05/2009, and c) Quantitative Easing Period of 03/06/2009 to 06/02/2010.

One of the major objectives of the monetary authority's policy actions is to influence market expectations on interest rates and inflation for different maturities. The Bank of England dataset includes spot and forward rates for OIS (Overnight Index Swap), LIBOR, and inflation rates for 50 different maturities ranging from 6 months to 25 years at 6 month intervals. However, in this paper we consider only seven different maturities: 6 month, 1 year, 2 year, 5 year, 10 year, 15 year and 20 year as our target variables. We do this for two reasons: a) to simplify the analysis and b) because rates of similar maturities show closely related time series patterns and the nature of herding together (as evident in Table 01 plots and descriptive statistics presented in Table 02 of Section Three). We also analyze the impact on stock market return, FTSE 100, investment and non-investment grade bond yields, and the exchange rate index.

2.2.1 Simple OLS setup

We use a simple OLS setup to analyze the effectiveness of conventional and unconventional policy tools for the three sample periods (overall period, pre-QE period, and QE period) on the target variables OIS, LIBOR, and inflation rate spots and forwards, market returns on stocks, bond yields, and foreign exchanges. Instead of using a Panel Fixed-effect or Random-effect procedure, we report OLS results to analyze the possible heterogeneous response of the target variables to the monetary tools. Table 03 of Section Three reports the OLS regression results, which show that the explanatory power of monetary policy tools for both sets, a) conventional and b) conventional and unconventional, reduces monotonically with the increase of maturity. There may be two possible explanations for such a pattern: a) spot and forward rates may be related in such a way that longer-term yields are affected by shorter-term yields consistent with the Expectation Hypothesis; b) spot and forward rates may display time series features such as autocorrelation or the data generation process of these variables may be an ARMA process. To analyze these issues, we discuss the time series properties of the variables and Granger causality relationships among them.

2.2.2 Time Series Properties of the Target Variables

In this section we analyze the data generating process of the target variables: the market index, exchange rate index, investment-grade and non-investment-grade bond yields, and spots and forwards of seven different maturities for LIBOR, OIS, and inflation rates. First, we report the autocorrelation function and partial autocorrelation of these variables and identify the appropriate AR process. Later, we present the ADF (Augmented Dickey Fuller) Test of the unit root to test whether the time series processes are integrated at order 1 or 0. The ADF test examines the null hypothesis that a time series is I(1) against the alternative that it is I(0), given the assumption that the data is an ARMA process. Table 05 and Table 06 of Section Three present the autocorrelation and partial autocorrelation functions and unit root tests of both the target and explanatory variables.

2.2.3 Granger Causality Test

Following a discussion of the time series properties of the target variables, we report pair-wise Granger causality tests for every possible combination of the target variables and conventional and non-conventional monetary policy tools. In such a setup, the presence of unidirectional causality indicates feedback from one direction while bidirectional causality indicates two way feedback. For monetary policy tools and target variables, rejection of "No Granger causality of monetary policy tool on Target variable" reveals that the monetary tool has impact on the target variables. Table 07 of Section Three summarizes the causality results. In addition to the impact of monetary policy tools, pair-wise Granger causality may provide further insight into the term structure and whether the Expectation Hypothesis holds. Any evidence of unidirectional Granger causality from short-term rates to long-term rates may support the Expectation Hypothesis.

2.2.4 Existence of Long-Run Equilibrium

Engle and Granger (1987) provide the theory and empirical testing methods of co-integration. The Engle and Granger two-step residual based co-integration test requires the estimation of a long-run co-integrating equation. In our case, we consider the following as the long-run equilibrium model:

$$y_{it} = \alpha_i + \beta_i . X_{it} + e_{it} \quad (1)$$

where we assume a linear relationship exists among the UK stock market index, exchange rate index, and other target variables, (y_i), and conventional and non-conventional monetary policy tools (vectors of X_i). Although co-integration tests are commonly used by financial economists in analyzing the long-run equilibrium relationship of non-stationary variables, there are concerns about the low power of co-integration tests when applied to shorter span data. Shiller and Perron (1985) point out that a smaller span of data, rather than frequency, is the cause of the "low power of these tests". Later, Pedroni (2004) discusses the panel co-integration approach to address this low power issue by bringing in additional cross-sectional data of similar relevance where additional time periods are not available.

The Quantitative Easing data sample also provides a unique case for the application of the Panel Co-integration technique as the sample period cannot be extended by any means. Thus, the only possible way to include more information is to allow a panel set up. Given the nature of the data and the shorter time span of the target variables, we choose the Pedroni (2004) residual-based panel co-integration test as our preferred technique rather than the structural approaches to test co-integration favored by Johansen and Jusellius (1994). The Pedroni (2004) set up allows us to analyze possible heterogeneity in the intercept and slope terms of a long run relationship, where the basic equation is:

$$y_{it} = \alpha_i + \delta_i . t + \beta_i . X_{it} + e_{it} \quad (2)$$

where, y_i, and X_{it} are the time series panel of observables for members i = 1, .. , N over time periods t = I,.. , T; and X_{it} is a k-dimensional column vector for each member i (a constant, foreign county stock index and foreign exchange rate). Here, α_i and δ_i ,as the parameters of member specific fixed effects and

deterministic trends, and the β_i parameter are allowed to vary across the members of panel. In Table 07 of Section Three, summary results of the Pedroni (2004) Panel Co-integration test statistics are presented.

III. Empirical Analysis

3.1 Descriptive Statistics

Following the global market collapse in September 2008, the Bank of England started reducing official bank rates on December 6, 2008 to increase liquidity and avoid a possible credit crunch. The bank further reduced the official bank rates five times between January 08, 2009 and February 07, 2009 by a total of 4 percent, from 5.50 percent to 1.50 percent. On March 05, 2009, the official bank rate was lowered to its threshold lowest level at 0.50. Subsequently, to increase liquidity and avoid deflation, the Bank of England undertook a Quantitative Easing policy regime that entailed active asset purchase participation of the bank during the near-zero bank rate era. On January 19, 2009 the Chancellor of Exchequer announced the decision to set up the asset purchase program. Following the announcement, the Bank of England established an asset purchase facility on January 30, 2009 and started the first purchases of commercial papers and gilts on February 13 and March 09, 2009 respectively. By February 2010 the Monetary Policy Committee of the Bank of England had approved the purchase of £200 billion worth of securities, an amount equivalent to 14% of nominal GDP, mostly in UK government securities commonly known as gilts.

Panel 01 of Table 01 presents the plot of the official bank rate during the overall sample period. It shows that following March 05, 2009 the official bank rate is maintained at a lower-bound threshold level. Other plots in Panel 02 to Panel 06 present the plots of OIS, LIBOR interest rate and Inflation rate spots and forwards for five different maturities: one year, two year, five year, fifteen year, and twenty year. Two distinct patterns are evident from plots of the target variables.

First, OIS (Overnight Interest Swaps) spots and forwards of lower maturities (one year and two year) show their rapid fall at the beginning of the financial turmoil that is consistent with the prevalent credit crunch. Other spot and forward rates however show the tendency to herd closely and not fall until the QE period. Panel 02 and Panel 03 also depict a similar declining trend for other interest rates even after the official bank rate is lowered to the threshold limit. Second, OIS spots and forwards become more aligned with the other spots and forward rates with higher maturities as evident in Panel 04. Panel 05 and Panel 06 show that the longer maturity yield curve becomes flatter over the time period.

[Insert Table 01 and Table 02 about here]

Later, Table 02 summarizes the descriptive statistics of the target variables and monetary policy tools. The most noteworthy statistics are in Panel C—during the QE period the official bank rate is constant at 0.50% with a standard deviation of zero. The plots in Table 01 and the descriptive statistics in Table 02 depict the main research issue addressed in this paper, namely how monetary policy tools impact the yield curves once the official bank rate is zero-bound. They also show that although the official bank rate is ineffective, some other monetary policy tools may be affecting the heterogeneous responses among the different maturity groups of spots and forwards.

3.2 Evidence from Simple OLS Regressions

Table 03 summarizes the OLS regression results for the impact of conventional monetary tools during the three periods, a) the overall period, b) the pre-QE period, and c) the QE period. Panel 1 presents that, in general, the impacts of conventional monetary tools M1, M2, M4, and official bank rates are significant in most occasions for market index, exchange index, and both investment grade and non-investment grade bond returns. However, the response to conventional policy tools is not homogenous over the three periods as the signs of coefficients are different in many instances. This pattern is consistent with the regime shift argument and shows the possible existence of a structural shift in the data.

Panel 2 and Panel 3 report regression results for inflation curve spot and forward rates respectively. Panel 2 shows that conventional monetary policy tools are significant in most occasions during the overall and post-QE period. However, M4 is not significant during the pre-QE period. Similar to Panel 01, Panel 02 provides evidence of a possible structural break for pre- and post- QE period. Results from other panels, Panel 04 to Panel 07, show a similar pattern of response to conventional monetary policy tools for LIBOR spot and forward and OIS spot and forward rates.

[Insert Table 03 about here]

OLS regression results in Panel 04 to Panel 07 also delineate another striking feature that, in general, the explanatory power of conventional monetary policy tools decreases as maturity increases. For Panel 02 and Panel 03 this pattern is not as prevalent.

3.3 Evidence from Simple OLS Regression during Quantitative Easing Period

The following section presents the impact of conventional and unconventional monetary policy tools on the yield structure based on simple OLS regression results. Panel 1 of Table 04 shows that the non-conventional policy tools of government gilt and corporate bond net purchases do not have a statistically significant impact on the market index, exchange index, and bond returns. Furthermore, M4 is not significant for the market index and non-investment-grade bonds.

Results in Panel 02 report that government gilt purchases is statistically significant for all LIBOR spots other than 6 month and one year. Panel 03 exhibits the similar impact of government gilt holding other than the 6 month forward. For both LIBOR spots and forwards in Panel 02 and 03, corporate bond net purchase is statistically insignificant. Panel 04 and Panel 05 summarize that, for both OIS spot and forward rates, government gilt purchases is statistically significant while corporate bond net purchase is not. Panel 06 provides similar information for Inflation spots. However, Panel 07 shows that none of the non-conventional tools are significant for Inflation forward rates.

[Insert Table 04 about here]

From the OLS regression of Table 04, we summarize that the conventional policy tools M1, M2, and M4 are generally significant for most of the target variables in most occasions. The official bank rate is also significant during the overall and pre-QE period. For all spots and forwards other than inflation forwards, government gilt purchases as a proxy of central bank balance sheet asset size is significant, however corporate net purchase is not.

During all three periods, the explanatory power of unconventional monetary tools decreases with the increase in maturity that reflects similar patterns for the OLS regression results for conventional monetary policy tools. The methodology section previously discussed two possible explanations: a) consistent with the Expectation Hypothesis, higher maturity rates are affected by the shorter maturity rates, b) interest rates are by themselves ARMA processes. To analyze these possible explanations, the following section investigatesthe time series properties of the target variables.

3.4 Time Series Properties of Target Variables

Table 05 reports the ACF (Autocorrelation Function) and PACF (Partial Autocorrelation) for the target variables followed by the appropriate AR process based on the AIC (Akaike Information Criterion) and SBC (Schwarz Criterion) selection criteria. The ACF and PACF of the time series variables show the existence of significant autocorrelation. PACF reduces drastically after one lag meaning that time series processes for the variables are in general AR(1) processes.

[Insert Table 05 and Table 06 about here]

ADF unit root statistics in Table 06 show that for the majority of the spot and forward rates, the variables are I(1) processes; that is, the variables are non-stationary at their level but stationary at their first differences. ADF unit root statistics are crucial for the co-integration tests that we use in a later section.

3.5 Granger Causality Tests

We also report pair-wise Granger causality tests to analyze a) whether there is any significant feedback between monetary policy tools and the target variables and b) whether any specific term structure exists within the different maturities of the target variables themselves. Results for the pair-wise Granger causality tests among the conventional and non-conventional monetary tools in Panel A of Table 07 show that the hypothesis that government gilt holdings do not exhibit Granger causality with M4 is the only one that can be rejected, while the others cannot. This implies that there is no causal relationship among the monetary tools themselves.

[Insert Table 07 about here]

For 6 month OIS and LIBOR spots and forwards, there is also not enough evidence of Granger causality with the monetary policy tools. However, for 1 year rates of OIS and LIBOR spot and forwards, there exists a unidirectional causality relationship between monetary policy tools and target variables. Within the different maturities of the spots and forwards, Granger causality results are significant in both the shorter maturity yields and longer maturity yields subgroups. To conclude, it is notable that the summary results of the Granger causality tests do not provide sufficient evidence in favor of the Expectation Hypothesis.

3.6 Existence of Long-Run Equilibrium: Pedroni (2004) Panel Co-integration Tests

In previous sections, we discussed the time series properties of the target variables LIBOR, OIS and inflation curve spots and forwards, market returns of FTSE 100, investment and non-investment bond returns, exchange index, and monetary policy tools. In general, the data generating processes of these time series variables are I(1) processes consistent with the pre-requisite for the co-integration test. Because the QE data cannot be extended, the only plausible way to allow for a longer time series span is to incorporate information from different cross sections.

To analyze the impact of a) conventional monetary policy tools and b) both conventional and non-conventional tools on the target spots and forward rates, we report Panel Co-integration results in different panels; for example, Panel 02 pulls all the LIBOR spot rates. The first column of Table 08 summarizes the Pedroni (2004) Panel Co-integration Tests for the Overall Period over the total time horizon. Column QE(a) reports panel co-integration given the conventional tools while column QE(b) reports panel co-integration given both conventional and unconventional tools. Evidence in favor of co-integration in such a set up may reveal the existence of long-run equilibrium or steady state.

[Insert Table 08 about here]

Tests statistics in Panel 01, Panel 02 and Panel 03 show robust evidence of co-integration for a) market index, exchange index and bond yields, b) LIBOR spots, and c) LIBOR forwards. However, test statistics for Panel 04 to Panel 07 fail to show evidence for co-integration for a) OIS spots, b) OIS forwards, c) Inflation spots, and d) Inflation forwards. In Panel 8, all the interest rates are pooled and then Panel Co-integration is performed. Results from all eight panels show only a few instances of co-integration, which means that within the selected panels across the spot or forward rates, the impact of monetary policy tools are not significant. There are few monetary explanations behind yield structures during the post 2008 financial crisis period.

IV Conclusion

This paper analyzes the impact of conventional and unconventional monetary policy tools on a set of interest rates with different maturities. Using a simple OLS regression, it discusses whether the response to conventional monetary tools is significant in a) the overall period, b) the pre-QE period, and c) the QE period. The official bank rate becomes ineffective as a monetary policy tool as it reaches the threshold lower bound and becomes fixed. During the QE period, government balance of gilt purchases is an effective non-conventional policy tool. However, there is no strong evidence of any significant impact of corporate bond net purchase. OLS regression results show that the explanatory power of monetary policy tools decreases monotonically with an increase in maturity. We consider two possible

explanations: a) spots and forward rates are interrelated consistent with the pure Expectation Hypothesis or b) spots and forward rates have autocorrelation.

The Autocorrelation Function and Partial Autocorrelation Functions of the target variables conform to the second explanation that the variables have significant autocorrelation. In general, most of the spots and forward rates are AR (1) processes. The ADF test of unit root shows that variables are mostly I(1) process with a few exceptions.

Pair-wise Granger causality tests reveal no evidence of a strong presence of Granger causality between different spots and forwards rates. However, monetary policy tools Granger cause target variables but are not caused otherwise. Results from pair-wise Granger causality do not provide enough evidence to confirm the Expectation Hypothesis.

Finally, the possibility of a long-run equilibrium relationship between monetary policy tools and target variables are analyzed by using the Pedroni (2004) Panel Co-integration technique. Results show that interest rates are generally co-integrated with the conventional and non-conventional monetary policy tools used during Quantitative Easing regimes. However, once we conduct panel co-integration for each group of interest rates separately, heterogeneity of responses to the monetary policy tools becomes prominent. Market index, exchange index, investment and non-investment bond yields, as a group, are co-integrated with monetary policy tools. Similar results hold for LIBOR spot and forward rates. However, OIS spots and forwards and inflation spots and forwards are not co-integrated with the combination of conventional and unconventional monetary policy tools used during Quantitative Easing regimes. The weak evidence of co-integration among the different panels may be interpreted as evidence that either a) there is a lack of existence of a steady state or long-run equilibrium between the target rates and monetary policy tools during the given time period, or b) the impact of monetary policy tools on target variables is not clear or otherwise mixed.

List of References

-------, Economic SYNOPSES.2010/ Number 17, Federal Reserve Bank of St. Louis

Ashraf, A., Hassan, K., & Hippler, W., 2015. *Monetary Shocks, Policy Tools, and Financial Firm Stock Returns: Evidence from the 2008 US Quantitative Easing.* Singapore Economic Review (*forthcoming*)

Auerbach, A. J., & Obstfeld, M. (2003). *The case for open-market purchases in a liquidity trap* (No. w9814). National Bureau of Economic Research.

Bernanke, B. and Reinhart, R. (2004). *Conducting Monetary Policy at Very Low Short-Term Interest Rates.* The American Economic Review, Vol. 94, No. 2, Papers and Proceedings of the One Hundred Sixteenth Annual Meeting of the American Economic Association San Diego, CA, January 3-5, 2004 (May, 2004), pp. 85-90.

Cúrdia, V. and Woodford, M. (2010). *Conventional and Unconventional Monetary Policy.* Federal Reserve Bank of St. Louis Review, July/August 2010, 92(4), pp. 229-64.

Eggertsson, Gauti B. and Woodford, M. (2004). *Policy Options in a Liquidity Trap.* The American Economic Review, Vol. 94, No. 2, Papers and Proceedings of the One Hundred Sixteenth Annual Meeting of the American Economic Association San Diego, CA, January 3-5, 2004 (May, 2004), pp. 76-79.

Johansen, S., & Juselius, K. (1994). Identification of the long-run and the short-run structure an application to the ISLM model. *Journal of Econometrics*, *63*(1), 7-36.

Joyce, M., Lasaosa, A., Stevens, I. and Tong, M. (2010). *The financial market impact of quantitative easing.* Bank of England, Working Paper No. 393, July 2010, revised August 2010.

Klyuev, V, de Imus, P and Srinivasan, K. (2009). *Unconventional choices for unconventional times: credit and quantitative easing in advanced economies.* IMF Staff Position Note, SPN/09/27, November 2009.

Pedroni, P. (2004). *Panel Co-integration: Asymptotic and Finite Sample Properties of Pooled Time Series with and Application to the PPP Hypothesis.* Econometric Theory, 597-625.

Shiller, R. J., & Perron, P. (1985). Testing the random walk hypothesis: Power versus frequency of observation. *Economics Letters*, *18*(4), 381-386.

Shiratsuka, S. (2010). *Size and Composition of the Central Bank Balance Sheet: Revisiting Japan's Experience of the Quantitative Easing Policy.* Monetary and Economic Studies/November 2010

Shirakawa, M. (2002). *One Year Under 'Quantitative Easing'. Bank of Japan.* IMES Discussion Paper Series 2002-E-3 April 2002.

Table 01: Plots of Term Structure

In Table 01, we present the time series plots of official bank rates in Panel 01. Panel 02 shows the time series plots of LIBOR spot and forward, OIS spot and forward, Nominal Govt. Spot and Forward for one year maturity. Other Panels such as Panel 03 through Panel 06 exhibit similar time series plots for 2 year, 5 year, 15 year and 20 year maturities.

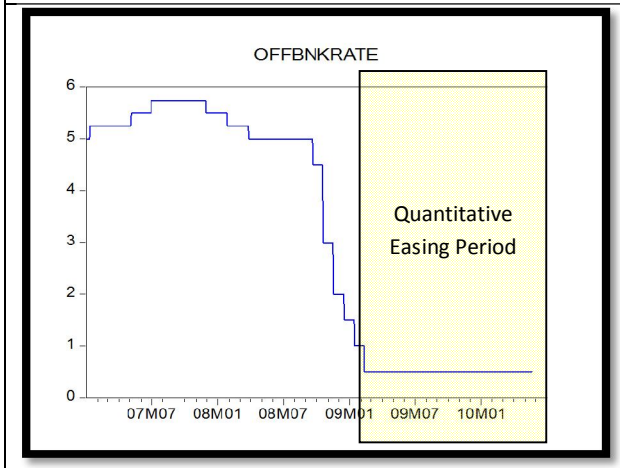
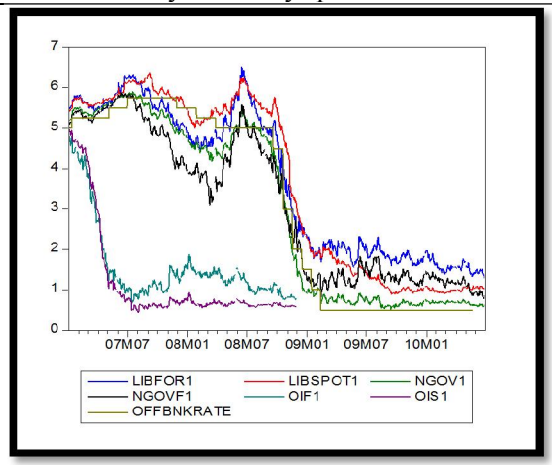
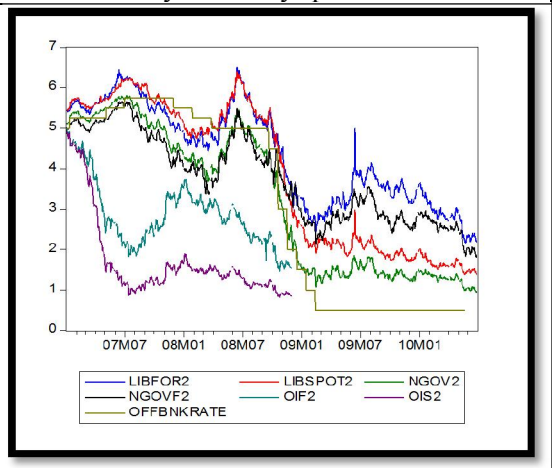
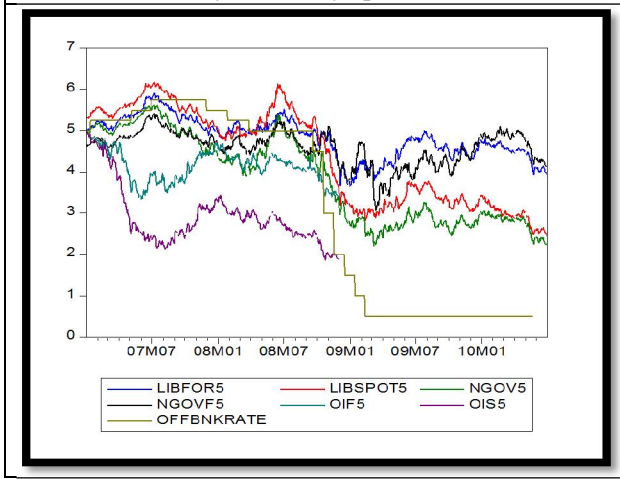
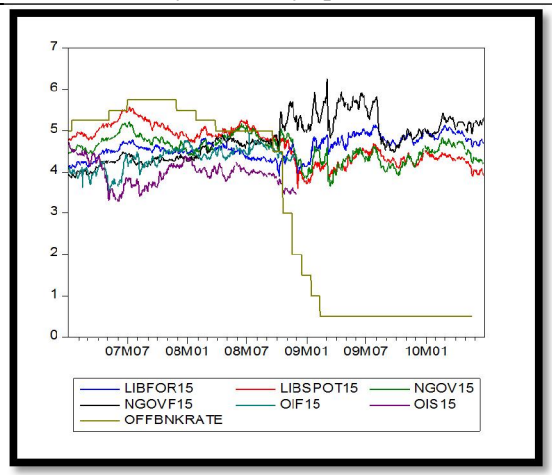
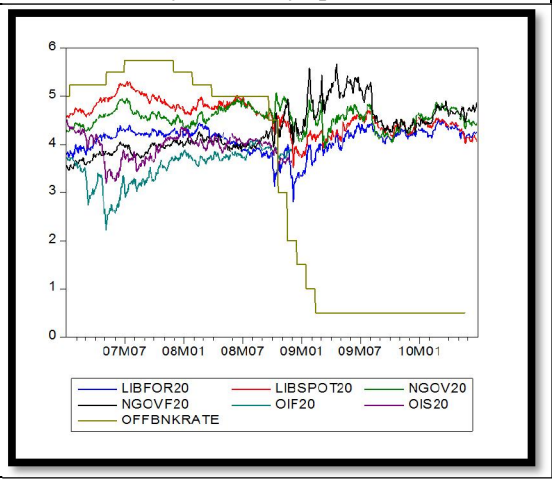
Panel 01: Official Bank Rates	Panel 02: 1 yr Maturity spots and forwards	Panel 03: 2 yr Maturity spots and forwards
		
Panel 04: 5 yr Maturity spots and forwards	**Panel 05: 15 yr Maturity spots and forwards**	**Panel 06: 20 yr Maturity spots and forwards**
		

Table 02: Descriptive Statistics of Monetary Policy tools, Stock Market Index, Exchange Rate Index and Bond Yields

We report the basic descriptive statistics (mean, maximum, minimum, and standard deviation) for Monetary Policy tools, Stock Market Index, Exchange Rate Index and Bond Yields for three sample periods; a) Overall Sample Period from 08/01/2008 to 06/02/2010 , b) Pre-Quantitative Easing Period from 08/01/2008 to 03/05/2009, and c) Quantitative Easing Period from 03/06/2009 to 06/02/2010 in Panel A, B and C respectively. M1, M2, M4 and Government Gilt Holding are in £ millions. Stock Market Index (FTSE100) and Exchange Rate Index (EXGIND) are in index and Official Bank Rate, Investment Grade Bond Yield and Non-investment Grade Bond Yields are in percentage.

	Panel A: Overall Sample Period				**Panel B: Pre-QE Period**				**Panel C: QE Period**			
	Mean	Max	Min	Std. Dev.	Mean	Max	Min	Std. Dev.	Mean	Max	Min	Std. Dev.
M1	53914.86	57121.00	50157.00	2056.76	51388.28	53201.00	50157.00	997.54	55135.12	57121.00	53201.00	1101.97
M2	98907.32	156405.00	27942.00	51903.97	38585.90	48367.00	27942.00	7180.54	128040.90	156405.00	39467.00	36880.14
M4	2007350.00	2208798.00	1776607.00	126820.50	1874059.00	1989966.00	1776607.00	67495.04	2071725.00	2208798.00	1977499.00	94435.88
Bank Rate	1.35	5.00	0.50	1.54	3.12	5.00	0.50	1.64	**0.50**	**0.50**	**0.50**	**0.00**
Govt. Gilt Holding	105156.20	125374.60	32677.68	32031.08	68939.70	125374.60	32677.68	34644.84	122647.80	125374.60	120130.50	1711.95
FTSE100	4806.63	5825.01	3512.09	591.25	4493.42	5636.61	3512.09	578.99	4957.90	5825.01	3753.68	535.80
EXGIND	81.68	93.28	73.75	4.14	83.89	93.28	73.75	6.02	80.61	85.26	75.69	2.11
Investment Grade Bond Yield	7.32	10.27	5.44	1.50	8.59	9.70	7.23	0.70	6.70	10.27	5.44	1.38
Non-Invest Grade Bond Yield	18.96	34.61	10.11	7.29	22.79	32.67	13.46	6.28	17.11	34.61	10.11	7.03
Sample Period		08/01/2008 to 06/02/2010				08/01/2008 to 03/05/2009				03/06/2009 to 06/02/2010		
No. of Observation		479				156				323		

Table 03: Impact of Conventional Monetary Policy Tools: Evidence from Simple OLS Regression

Panel 1: Market Index, Exchange Rate Index, Bond Yields

Dependent Variables		Full Sample						Pre-QE sample						Post-QE Sample				
		C	LN_M1	LN_M2	LN_M4	BNK	R^2	C	LN_M1	LN_M2	LN_M4	BNK	R^2	C	LN_M1	LN_M2	LN_M4	R^2
FTSE 100	Coeff.	-36.46	5.02	0.08	-0.74	0.1	0.71	38.02	5.5	-0.23	-6.01	-0.03	0.75	-22.6	2.65	0.13	0.05	0.81
	Prob.	0.00	0.00	0.00	0.00	0.00		0.04	0.08	0.00	0.00	0.12		0.00	0.00	0.00	0.78	
EXCH INDEX	Coeff.	-186.03	110.02	1.99	-65.97	2.9	0.75	-281.2	-9.94	-6.64	36.83	3.54	0.9	697.09	-27.6	3.53	-24.51	0.44
	Prob.	0.10	0.00	0.00	0.00	0.00		0.61	0.92	0.00	0.38	0.00		0.00	0.09	0.00	0.00	
INV Bond	Coeff.	431.59	-47.41	-1.51	7.62	-0.89	0.9	-211.65	-44.06	1.33	47.3	0.3	0.81	385.35	-39.05	-1.99	4.88	0.95
	Prob.	0.00	0.00	0.00	0.00	0.00		0.02	0.01	0.00	0.00	0.00		0.00	0.00	0.00	0.00	
Non Inv.	Coeff.	2355.1	-249.78	-7.44	32.95	-6.49	0.9	-2101.32	140.58	10.91	33.59	-0.31	0.95	1888.4	-173.26	-10.11	9.52	0.96
	Prob.	0.00	0.00	0.00	0.00	0.00		0.00	0.04	0.00	0.26	0.38		0.00	0.00	0.00	0.07	
Panel 2: Inflation curve, Spot																		
IS2	Coeff.	-442.95	41.09	0.28	-0.47	-0.37	0.96	3881.66	380.32	-94.28	-484.15	-0.82	0.62	-470.54	45.31	0.28	-1.75	0.97
	Prob.	0.00	0.00	0.00	0.62	0.00		0.11	0.22	0.11	0.17	0.02		0.00	0.00	0.00	0.00	
IS5	Coeff.	-460.03	59.42	-0.47	-12.47	0.64	0.52	92.92	-3.68	-0.86	-2.80	-0.04	0.63	-119.03	6.21	0.52	3.26	0.79
	Prob.	0.00	0.00	0.00	0.00	0.00		0.10	0.71	0.00	0.52	0.46		0.00	0.01	0.00	0.00	
IS10	Coeff.	-263.54	32.77	-0.17	-6.15	0.43	0.51	-15.81	-8.49	-3.70	10.32	0.07	0.83	-68.60	2.40	0.43	2.77	0.70
	Prob.	0.00	0.00	0.04	0.00	0.00		0.85	0.57	0.00	0.11	0.40		0.00	0.25	0.00	0.00	
IS15	Coeff.	-131.40	16.36	0.02	-3.04	0.27	0.44	25.12	-1.63	-1.93	1.10	0.04	0.78	-10.14	-2.75	0.36	2.70	0.53
	Prob.	0.00	0.00	0.74	0.00	0.00		0.69	0.88	0.00	0.82	0.50		0.39	0.14	0.00	0.00	
IS20	Coeff.	-37.93	5.17	0.16	-1.16	0.15	0.31	92.92	-3.68	-0.86	-2.80	-0.04	0.63	30.63	-5.83	0.34	2.24	0.31
	Prob.	0.00	0.00	0.00	0.07	0.00		0.10	0.71	0.00	0.52	0.46		0.01	0.00	0.00	0.00	
Panel 3: Inflation Curve, Forward																		
IF2	Coeff.	-315.85	30.57	-0.17	-0.96	0.41	0.83	467.76	-205.39	1.47	120.84	-0.01	0.43	462.88	-204.96	1.44	120.88	0.43
	Prob.	0.00	0.00	0.01	0.24	0.00		0.74	0.26	0.97	0.56	0.95		0.74	0.26	0.97	0.56	
IF5	Coeff.	-123.52	14.93	-0.13	-2.41	0.21	0.21	85.95	-17.25	-2.78	9.26	-0.14	0.67	-55.23	0.37	-2.69	5.71	0.67
	Prob.	0.00	0.00	0.08	0.02	0.00		0.29	0.22	0.00	0.14	0.06		0.11	0.97	0.00	0.34	
IF10	Coeff.	21.37	-3.82	0.29	1.43	0.12	0.30	3.19	11.62	0.39	-8.98	0.12	0.49	120.52	-3.02	0.32	-6.03	0.48
	Prob.	0.08	0.04	0.00	0.04	0.00		0.96	0.34	0.01	0.09	0.06		0.00	0.74	0.03	0.24	
IF15	Coeff.	225.90	-27.18	0.53	4.75	-0.16	0.47	225.11	4.97	2.46	-20.75	-0.17	0.73	53.38	26.41	2.56	-25.08	0.71
	Prob.	0.00	0.00	0.00	0.00	0.00		0.00	0.64	0.00	0.00	0.00		0.04	0.00	0.00	0.00	
IF20	Coeff.	215.50	-23.89	0.56	2.97	-0.25	0.47	310.79	-21.81	1.83	-6.11	-0.31	0.61	4.08	16.48	2.02	-13.83	0.55
	Prob.	0.00	0.00	0.00	0.00	0.00		0.00	0.07	0.00	0.25	0.00		0.90	0.09	0.00	0.01	

		Full Sample						Pre-QE sample						Post-QE Sample				
		C	LN_M1	LN_M2	LN_M4	BNK	R^2	C	LN_M1	LN_M2	LN_M4	BNK	R^2	C	LN_M1	LN_M2	LN_M4	R^2
Panel 4: LIBOR swap curve, spot																		
0_5 yr	Coeff.	11.81	-0.61	-0.57	0.13	0.90	0.99	24.06	-20.37	-0.66	14.17	1.00	0.98	51.42	-6.70	-0.58	2.02	0.87
	Prob.	0.26	0.71	0.00	0.82	0.00		0.74	0.11	0.00	0.01	0.00		0.00	0.00	0.00	0.00	
1 yr	Coeff.	-32.40	8.08	-0.56	-3.34	0.82	0.98	-1.92	3.46	-1.31	-1.43	0.80	0.98	52.81	-5.46	-0.43	0.89	0.84
	Prob.	0.00	0.00	0.00	0.00	0.00		0.98	0.76	0.00	0.77	0.00		0.00	0.00	0.00	0.02	
2 yr	Coeff.	5.67	9.08	-0.14	-6.99	0.63	0.96	43.22	7.99	-1.35	-7.88	0.58	0.97	136.20	-11.74	0.08	-0.49	0.78
	Prob.	0.66	0.00	0.00	0.00	0.00		0.47	0.44	0.00	0.09	0.00		0.00	0.00	0.01	0.26	
5 yr	Coeff.	68.84	3.22	0.40	-7.27	0.37	0.88	51.93	-1.11	-0.89	-1.92	0.42	**0.85**	219.95	-20.69	0.65	0.11	0.81
	Prob.	0.00	0.12	0.00	0.00	0.00		0.23	0.88	0.00	0.57	0.00		0.00	0.00	0.00	0.82	
10 yr	Coeff.	40.54	0.10	0.41	-2.93	0.24	0.74	26.86	-12.33	-0.68	8.13	0.31	0.93	153.08	-17.51	0.61	2.40	0.64
	Prob.	0.00	0.95	0.00	0.00	0.00		0.55	0.12	0.00	0.02	0.00		0.00	0.00	0.00	0.00	
15 yr	Coeff.	33.77	-1.33	0.36	-1.33	0.14	0.53	17.26	-14.76	-0.57	10.57	0.21	0.82	125.31	-15.55	0.52	2.94	0.54
	Prob.	0.00	0.40	0.00	0.02	0.00		0.72	0.08	0.00	0.00	0.00		0.00	0.00	0.00	0.00	
20 yr	Coeff.	23.52	-0.67	0.31	-1.07	0.09	0.34	16.99	-13.55	-0.59	9.69	0.15	0.70	110.48	-14.21	0.47	2.99	0.50
	Prob.	0.02	0.66	0.00	0.05	0.00		0.72	0.11	0.00	0.01	0.00		0.00	0.00	0.00	0.00	
Panel 5: LIBOR swap curve, forward																		
0_5 yr	Coeff.	-69.08	12.65	-0.71	-4.13	0.86	0.98	-52.89	16.98	-1.80	-7.70	0.80	0.98	37.13	-4.26	-0.50	1.13	0.77
	Prob.	0.00	0.00	0.00	0.00	0.00		0.42	0.14	0.00	0.13	0.00		0.00	0.00	0.00	0.02	
1 yr	Coeff.	-51.93	17.00	-0.31	-8.85	0.62	0.93	34.67	22.72	-1.90	-17.95	0.44	0.96	94.32	-6.49	0.00	-1.49	0.68
	Prob.	0.00	0.00	0.00	0.00	0.00		0.64	0.08	0.00	0.00	0.00		0.00	0.00	0.98	0.00	
2 yr	Coeff.	118.50	4.07	0.70	-11.56	0.32	0.83	89.77	6.98	-0.86	-10.64	0.37	0.97	310.90	-26.54	1.01	-2.05	0.81
	Prob.	0.00	0.14	0.00	0.00	0.00		0.07	0.41	0.00	0.01	0.00		0.00	0.00	0.00	0.01	
5 yr	Coeff.	57.61	-2.44	0.61	-2.32	0.15	0.53	21.30	-16.08	-0.55	11.25	0.26	0.85	180.07	-21.54	0.82	3.44	0.65
	Prob.	0.00	0.21	0.00	0.00	0.00		0.68	0.08	0.00	0.01	0.00		0.00	0.00	0.00	0.00	
10 yr	Coeff.	5.96	-3.87	0.30	2.59	0.02	0.47	-7.43	-24.96	-0.38	19.83	0.12	0.17	55.24	-11.22	0.40	4.64	0.51
	Prob.	0.55	0.01	0.00	0.00	0.05		0.91	0.03	0.01	0.00	0.05		0.00	0.00	0.00	0.00	
15 yr	Coeff.	21.92	-3.14	0.22	1.01	-0.10	0.64	6.90	-14.20	-0.42	10.81	-0.04	0.31	78.83	-11.91	0.33	3.59	0.32
	Prob.	0.02	0.03	0.00	0.05	0.00		0.90	0.16	0.00	0.02	0.43		0.00	0.00	0.00	0.00	
20 yr	Coeff.	-48.70	7.11	0.14	-1.82	0.00	0.62	24.67	-6.16	-0.90	3.84	-0.06	0.23	44.45	-7.65	0.32	2.72	0.48
	Prob.	0.00	0.00	0.00	0.00	0.70		0.70	0.58	0.00	0.43	0.30		0.00	0.00	0.00	0.00	

		Full Sample						Pre-QE sample						Post-QE Sample				
		C	LN_M1	LN_M2	LN_M4	BNK	R^2	C	LN_M1	LN_M2	LN_M4	BNK	R^2	C	LN_M1	LN_M2	LN_M4	R^2
Panel 6: OIS curve, spot																		
0_5 yr	Coeff.	-184.08	27.91	-0.43	-7.96	1.08	0.96	96.76	4.14	-2.64	-7.86	0.71	0.99	-15.99	0.97	-0.05	0.45	0.37
	Prob.	0.00	0.00	0.00	0.00	0.00		0.11	0.69	0.00	0.09	0.00		0.00	0.02	0.00	0.00	
1 yr	Coeff.	-166.86	28.57	-0.32	-9.71	0.97	0.94	84.74	15.19	-2.63	-15.32	0.60	0.98	15.16	-0.68	0.09	-0.56	0.29
	Prob.	0.00	0.00	0.00	0.00	0.00		0.17	0.15	0.00	0.00	0.00		0.00	0.22	0.00	0.00	
2 yr	Coeff.	-59.67	20.83	0.13	-11.58	0.74	0.92	90.52	18.68	-1.93	-18.81	0.49	0.98	129.83	-9.59	0.52	-2.06	0.78
	Prob.	0.00	0.00	0.04	0.00	0.00		0.11	0.06	0.00	0.00	0.00		0.00	0.00	0.00	0.00	
5 yr	Coeff.	70.90	6.01	0.63	-9.72	0.39	0.85	91.43	4.39	-1.08	-8.69	0.37	0.98	250.31	-22.51	0.96	-0.90	0.86
	Prob.	0.00	0.01	0.00	0.00	0.00		0.04	0.57	0.00	0.01	0.00		0.00	0.00	0.00	0.07	
10 yr	Coeff.	53.52	1.84	0.56	-5.27	0.24	0.74	51.64	-8.94	-0.85	3.97	0.27	0.93	185.94	-18.93	0.81	1.02	0.80
	Prob.	0.00	0.34	0.00	0.00	0.00		0.30	0.30	0.00	0.30	0.00		0.00	0.00	0.00	0.02	
15 yr	Coeff.	50.71	-0.88	0.49	-2.96	0.13	0.58	58.87	-18.86	-0.69	10.82	0.18	0.83	153.58	-16.86	0.69	1.81	0.74
	Prob.	0.00	0.60	0.00	0.00	0.00		0.24	0.03	0.00	0.01	0.00		0.00	0.00	0.00	0.00	
20 yr	Coeff.	26.19	0.82	0.43	-2.49	0.11	0.47	61.34	-18.75	-0.77	10.63	0.12	0.76	125.73	-14.68	0.63	2.14	0.71
	Prob.	0.01	0.61	0.00	0.00	0.00		0.23	0.04	0.00	0.01	0.01		0.00	0.00	0.00	0.00	
Panel 7: OIS curve, forward																		
0_5 yr	Coeff.	-205.12	32.79	-0.46	-10.14	1.00	0.93	78.47	17.97	-3.11	-16.63	0.57	0.98	-4.56	0.59	0.01	-0.09	0.04
	Prob.	0.00	0.00	0.00	0.00	0.00		0.23	0.11	0.00	0.00	0.00		0.22	0.31	0.59	0.64	
1 yr	Coeff.	-85.86	24.94	0.06	-12.82	0.73	0.90	63.59	31.29	-2.12	-26.29	0.44	0.98	110.08	-6.61	0.48	-2.91	0.71
	Prob.	0.00	0.00	0.38	0.00	0.00		0.31	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	
2 yr	Coeff.	152.85	2.53	0.99	-13.03	0.32	0.83	141.42	7.58	-0.58	-14.91	0.34	0.97	349.62	-28.88	1.31	-3.22	0.86
	Prob.	0.00	0.37	0.00	0.00	0.00		0.00	0.38	0.00	0.00	0.00		0.00	0.00	0.00	0.00	
5 yr	Coeff.	91.53	-3.13	0.70	-4.23	0.13	0.60	16.95	-7.61	-0.67	5.27	0.24	0.84	226.79	-24.24	0.97	2.11	0.78
	Prob.	0.00	0.13	0.00	0.00	0.00		0.76	0.44	0.00	0.23	0.00		0.00	0.00	0.00	0.00	
10 yr	Coeff.	37.52	-5.14	0.39	1.29	-0.01	0.42	44.30	-37.51	-0.39	25.67	0.09	0.20	85.58	-12.13	0.50	3.15	0.51
	Prob.	0.00	0.00	0.00	0.03	0.22		0.50	0.00	0.01	0.00	0.14		0.00	0.00	0.00	0.00	
15 yr	Coeff.	19.40	-2.98	0.31	0.96	-0.06	0.62	84.43	-32.52	-0.59	19.30	-0.05	0.24	78.58	-11.98	0.44	3.55	0.52
	Prob.	0.04	0.04	0.00	0.06	0.00		0.14	0.00	0.00	0.00	0.30		0.00	0.00	0.00	0.00	
20 yr	Coeff.	-114.16	14.98	0.17	-3.29	0.17	0.63	48.12	-3.58	-1.37	0.58	-0.03	0.54	2.72	-3.65	0.43	2.46	0.82
	Prob.	0.00	0.00	0.00	0.00	0.00		0.50	0.77	0.00	0.92	0.65		0.64	0.00	0.00	0.00	

Table 04: Quantitative Easing: Evidence from Simple OLS Regression

In Table 04, we report OLS regression results of monetary policy tools during the QE sample period for market index, foreign exchange index and investment and non-investment grade bond indexes in Panel 01. In Panel 02 through Panel 07, we report similar OLS regression results for other target forward and spot variables of different maturities.

		Panel 1: Market Index, Exchange Rate Index, Bond Yields						
		C	LN_M1	LN_M2	LN_M4	LN_GILTHLD	NET	R^2
FTSE 100	Coeff.	-18.098	2.886	0.118	-0.102	-0.410	0.000	0.816
	Prob.	0.003	0.000	0.000	0.597	0.248	0.111	
EXCH INDEX	Coeff.	820.955	-31.182	3.538	-25.021	-6.609	0.001	0.447
	Prob.	0.000	0.061	0.000	0.000	0.566	0.902	
INV Bond	Coeff.	360.857	-39.597	-1.966	5.380	1.954	0.000	0.953
	Prob.	0.000	0.000	0.000	0.000	0.377	0.669	
Non INV Bond	Coeff.	1924.407	-177.209	-9.998	10.537	-0.771	0.006	0.957
	Prob.	0.000	0.000	0.000	0.072	0.943	0.253	

Table 04: Quantitative Easing: Evidence from Simple OLS Regression

		Panel 2: LIBOR swap curve, spot								Panel 3: LIBOR swap curve, forward						
Maturity		C	LN_M1	LN_M2	LN_M4	LN_GILT	NET	R^2	Maturity	C	LN_M1	LN_M2	LN_M4	LN_GILT	NET	R^2
0_5 yr	Coeff.	54.357	-6.729	-0.586	1.975	-0.156	-0.001	0.867	0_5 yr	33.273	-4.318	-0.502	1.175	0.323	-0.001	0.776
	Prob.	0.000	0.000	0.000	0.000	0.857	0.220			0.045	0.003	0.000	0.029	0.743	0.192	
1 yr	Coeff.	57.868	-5.363	-0.438	0.770	-0.361	-0.001	0.843	1 yr	124.355	-5.937	-0.040	-2.109	-2.273	-0.001	0.689
	Prob.	0.000	0.000	0.000	0.067	0.640	0.116			0.000	0.000	0.249	0.000	0.017	0.179	
2 yr	Coeff.	171.991	-11.251	0.042	-1.164	-2.633	-0.001	0.784	2 yr	399.275	-25.610	0.921	-3.569	-6.428	0.000	0.824
	Prob.	0.000	0.000	0.196	0.016	0.003	0.200			0.000	0.000	0.000	0.000	0.000	0.828	
5 yr	Coeff.	307.800	-19.818	0.562	-1.392	-6.365	0.000	0.832	5 yr	324.516	-20.111	0.680	0.971	-10.457	0.000	0.753
	Prob.	0.000	0.000	0.000	0.005	0.000	0.674			0.000	0.000	0.000	0.052	0.000	0.406	
10 yr	Coeff.	259.054	-16.377	0.497	0.558	-7.700	-0.001	0.721	10 yr	152.526	-10.056	0.296	2.890	-7.108	-0.001	0.608
	Prob.	0.000	0.000	0.000	0.189	0.000	0.184			0.000	0.000	0.000	0.000	0.000	0.027	
15 yr	Coeff.	222.403	-14.498	0.420	1.236	-7.059	-0.001	0.640	15 yr	143.839	-11.182	0.262	2.433	-4.725	-0.001	0.396
	Prob.	0.000	0.000	0.000	0.003	0.000	0.115			0.000	0.000	0.000	0.000	0.000	0.106	
20 yr	Coeff.	196.995	-13.275	0.382	1.475	-6.283	-0.001	0.600	20 yr	86.455	-7.267	0.278	2.002	-3.010	0.000	0.513
	Prob.	0.000	0.000	0.000	0.000	0.000	0.104			0.000	0.000	0.000	0.000	0.000	0.216	

		Panel 4: OIS curve, spot								Panel 5: OIS curve, forward						
0_5 yr	Coeff.	-6.079	1.115	-0.065	0.253	-0.731	0.000	0.392	0_5 yr	9.473	0.799	-0.011	-0.369	-1.037	0.000	0.067
	Prob.	0.194	0.006	0.000	0.095	0.009	0.080			0.164	0.170	0.464	0.093	0.011	0.072	
1 yr	Coeff.	30.318	-0.447	0.069	-0.856	-1.122	0.000	0.313	1 yr	137.644	-6.151	0.445	-3.453	-2.073	0.000	0.717
	Prob.	0.000	0.414	0.000	0.000	0.003	0.104			0.000	0.000	0.000	0.000	0.025	0.422	
2 yr	Coeff.	161.658	-9.139	0.483	-2.652	-2.359	0.000	0.789	2 yr	421.265	-28.085	1.234	-4.470	-5.240	0.000	0.868
	Prob.	0.000	0.000	0.000	0.000	0.003	0.459			0.000	0.000	0.000	0.000	0.000	0.973	
5 yr	Coeff.	328.995	-21.656	0.883	-2.265	-5.739	0.000	0.870	5 yr	350.122	-22.914	0.841	-0.034	-8.975	0.000	0.835
	Prob.	0.000	0.000	0.000	0.000	0.000	0.813			0.000	0.000	0.000	0.945	0.000	0.381	
10 yr	Coeff.	276.630	-17.895	0.718	-0.583	-6.623	0.000	0.834	10 yr	162.933	-11.144	0.409	1.731	-5.677	-0.001	0.584
	Prob.	0.000	0.000	0.000	0.170	0.000	0.243			0.000	0.000	0.000	0.000	0.000	0.031	
15 yr	Coeff.	235.536	-15.916	0.607	0.355	-5.982	-0.001	0.786	15 yr	135.216	-11.375	0.380	2.550	-4.104	-0.001	0.570
	Prob.	0.000	0.000	0.000	0.365	0.000	0.139			0.000	0.000	0.000	0.000	0.000	0.130	
20 yr	Coeff.	198.953	-13.849	0.552	0.846	-5.337	-0.001	0.760	20 yr	40.189	-3.310	0.389	1.821	-2.677	0.000	0.832
	Prob.	0.000	0.000	0.000	0.021	0.000	0.124			0.000	0.000	0.000	0.000	0.000	0.146	

Table 04: Quantitative Easing: Evidence from Simple OLS Regression

		Panel 6: Inflation curve, Spot								Panel 7: Inflation Curve, Forward						
		C	LN_M1	LN_M2	LN_M4	LN_GILT	NET	R^2		C	LN_M1	LN_M2	LN_M4	LN_GILT	NET	R^2
IS2	Coeff.	-420.338	44.394	0.259	-2.194	-2.861	-0.001	0.975	IF2	-342.231	34.676	-0.224	-2.105	-0.086	0.000	0.876
	Prob.	0.000	0.000	0.000	0.000	0.007	0.096			0.000	0.000	0.000	0.002	0.948	0.519	
	Coeff.	-470.537	45.310	0.279	-1.752			0.973		-343.876	34.668	-0.220	-2.059			0.876
	Prob.	0.000	0.000	0.000	0.001					0.000	0.000	0.000	0.001			
IS5	Coeff.	9.851	7.975	0.376	0.884	-9.551	-0.001	0.815	IF5	79.967	1.723	0.206	-0.329	-7.969	0.000	0.399
	Prob.	0.705	0.000	0.000	0.294	0.000	0.278			2.647	0.666	3.160	-0.336	-4.431	-0.375	
	Coeff.	-119.028	6.208	0.521	3.262			0.788		-26.673	0.165	0.326	1.657			0.354
	Prob.	0.000	0.008	0.000	0.000					-1.581	0.062	5.248	1.813			
IS10	Coeff.	27.343	3.832	0.320	0.959	-7.162	-0.001	0.728	IF10	76.078	-7.879	0.256	2.454	-2.109	-0.001	0.157
	Prob.	0.252	0.062	0.000	0.215	0.000	0.309			0.002	0.000	0.000	0.002	0.151	0.228	
	Coeff.	-68.600	2.402	0.431	2.769			0.701		48.974	-8.523	0.298	3.068			0.147
	Prob.	0.000	0.254	0.000	0.000					0.000	0.000	0.000	0.000			
IS15	Coeff.	58.616	-1.694	0.282	1.384	-5.138	-0.001	0.555	IF15	152.292	-14.985	0.206	1.396	-0.612	0.000	0.314
	Prob.	0.006	0.353	0.000	0.045	0.000	0.239			0.000	0.000	0.003	0.182	0.750	0.636	
	Coeff.	-10.138	-2.753	0.364	2.701			0.525		142.903	-14.988	0.216	1.542			0.313
	Prob.	0.391	0.137	0.000	0.000					0.000	0.000	0.001	0.102			
IS20	Coeff.	84.508	-5.059	0.281	1.227	-3.996	-0.001	0.339	IF20	171.012	-15.651	0.326	0.652	-0.784	0.000	0.542
	Prob.	0.000	0.004	0.000	0.064	0.001	0.339			0.000	0.000	0.000	0.363	0.552	0.804	
	Coeff.	30.628	-5.829	0.343	2.239	0.312				158.637	-15.529	0.331	0.777			0.542
	Prob.	0.007	0.001	0.000	0.000					0.000	0.000	0.000	0.229			

Table 05: Auto-Correlation Function (ACF) and Partial Auto-Correlation Function (PACF) of the time series variables

Panel 1 to Panel 8 of Table 04 present the ACF and PACF of the variables for the overall sample period 08/01/2008 to 06/02/2010 with 479 daily observations. AR processes are selected based on AIC (Akaike Information Criterion) and SBC (Schwarz Criterion). ACF and PACF for Lag 12 are presented instead of higher lags for the ease of presentation.

	Panel 1: Market Index, Exchange Rate Index, Bond Yields								**Panel 2: Conventional Monetary Policy Tools**									
	LN_FTSE100		EXGIND		INV_GRD		NON_INV_GRD		Bank Rate		Ln_M1		Ln_M2		Ln_M4		Ln_Gilt_Hldg	
	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC
1	0.987	0.987	0.981	0.981	0.997	0.997	0.997	0.997	0.992	0.992	0.993	0.993	0.995	0.995	0.991	0.991	0.989	0.989
2	0.975	0.032	0.961	-0.048	0.994	-0.089	0.993	-0.032	0.984	-0.004	0.987	-0.003	0.989	-0.003	0.983	-0.004	0.977	-0.006
3	0.965	0.084	0.941	-0.018	0.991	-0.019	0.989	0.007	0.976	-0.004	0.980	-0.003	0.984	-0.003	0.974	-0.004	0.966	-0.006
4	0.957	0.069	0.922	0.021	0.988	-0.033	0.985	-0.040	0.968	-0.004	0.973	-0.003	0.978	-0.003	0.965	-0.004	0.954	-0.006
5	0.945	-0.170	0.904	0.019	0.984	-0.049	0.981	-0.049	0.960	-0.004	0.966	-0.003	0.973	-0.003	0.957	-0.004	0.943	-0.006
6	0.935	0.113	0.887	0.004	0.981	0.023	0.977	-0.019	0.952	-0.004	0.960	-0.003	0.967	-0.003	0.948	-0.004	0.932	-0.006
7	0.927	0.031	0.868	-0.045	0.977	0.005	0.972	-0.017	0.944	-0.004	0.953	-0.003	0.962	-0.003	0.939	-0.004	0.920	-0.006
8	0.917	-0.073	0.849	-0.024	0.974	-0.007	0.967	-0.039	0.936	-0.004	0.946	-0.003	0.956	-0.003	0.931	-0.004	0.909	-0.006
9	0.905	-0.026	0.833	0.099	0.970	-0.030	0.962	-0.040	0.928	-0.004	0.939	-0.003	0.951	-0.003	0.922	-0.004	0.898	-0.006
10	0.895	-0.019	0.817	-0.038	0.966	-0.018	0.957	-0.013	0.920	-0.004	0.933	-0.003	0.945	-0.003	0.913	-0.005	0.886	-0.006
11	0.883	-0.045	0.802	0.022	0.962	-0.011	0.952	-0.008	0.912	-0.004	0.926	-0.003	0.940	-0.003	0.905	-0.005	0.875	-0.006
12	0.873	0.077	0.790	0.078	0.958	-0.014	0.946	-0.021	0.904	-0.004	0.919	-0.003	0.934	-0.003	0.896	-0.005	0.863	-0.006
AR Process		1		1		1		1		1		1		1		1		1

Table 05: Auto-Correlation Function (ACF) and Partial Auto-Correlation Function (PACF) of the time series variables

Panel 3: LIBOR swap curve, spot

	0_5 yr		1 yr		2 yr		5 yr		10 yr		15 yr		20 yr	
	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC
1	0.994	0.994	0.992	0.992	0.989	0.989	0.986	0.986	0.980	0.980	0.970	0.970	0.965	0.965
2	0.987	-0.018	0.984	-0.009	0.979	0.023	0.973	-0.013	0.960	-0.025	0.940	-0.016	0.931	-0.007
3	0.981	-0.014	0.977	-0.005	0.969	-0.003	0.959	0.002	0.940	0.014	0.912	0.006	0.898	-0.006
4	0.974	-0.018	0.969	-0.009	0.959	0.009	0.946	0.003	0.922	0.010	0.885	0.009	0.866	0.007
5	0.967	-0.019	0.961	-0.014	0.949	-0.005	0.933	0.017	0.904	0.007	0.860	0.023	0.838	0.030
6	0.960	-0.013	0.952	-0.011	0.939	-0.021	0.921	0.025	0.888	0.045	0.837	0.024	0.810	-0.006
7	0.953	-0.016	0.944	-0.024	0.929	-0.019	0.909	-0.021	0.873	0.014	0.816	0.025	0.785	0.025
8	0.945	-0.018	0.935	-0.012	0.919	-0.002	0.897	0.007	0.859	0.020	0.798	0.040	0.763	0.047
9	0.938	0.002	0.927	0.023	0.909	0.029	0.886	0.020	0.846	0.026	0.782	0.022	0.743	0.006
10	0.931	-0.008	0.919	-0.013	0.899	-0.013	0.874	-0.030	0.831	-0.053	0.763	-0.053	0.720	-0.048
11	0.923	-0.017	0.910	-0.019	0.889	-0.021	0.862	-0.031	0.815	-0.029	0.741	-0.044	0.694	-0.047
12	0.915	-0.015	0.902	-0.010	0.879	-0.009	0.849	0.003	0.800	0.014	0.722	0.028	0.673	0.051
AR Process		1		1		1		1		1		1		1

Panel 4: LIBOR swap curve, forward

	0_5 yr		1 yr		2 yr		5 yr		10 yr		15 yr		20 yr	
	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC
1	0.992	0.992	0.986	0.986	0.98	0.98	0.975	0.975	0.965	0.965	0.974	0.974	0.981	0.981
2	0.983	-0.008	0.973	0.039	0.964	0.096	0.949	-0.031	0.934	0.047	0.951	0.026	0.965	0.072
3	0.975	-0.002	0.961	0.021	0.947	-0.021	0.925	0.02	0.905	0.011	0.927	-0.019	0.947	-0.041
4	0.967	-0.005	0.949	-0.004	0.932	0.056	0.902	0.006	0.878	0.014	0.904	0.005	0.93	-0.009
5	0.958	-0.02	0.938	0.01	0.918	0.005	0.88	-0.001	0.85	-0.011	0.882	0.013	0.911	-0.055
6	0.949	-0.012	0.926	0	0.904	0.002	0.861	0.062	0.822	-0.024	0.857	-0.064	0.889	-0.085
7	0.94	-0.023	0.914	-0.049	0.89	-0.005	0.843	0.018	0.798	0.039	0.835	0.028	0.87	0.047
8	0.931	-0.011	0.902	0.009	0.877	0.022	0.827	0.029	0.776	0.024	0.815	0.046	0.852	0.035
9	0.923	0.028	0.89	0.026	0.865	0.018	0.812	0.005	0.756	0.034	0.796	0.005	0.835	0.008
10	0.914	-0.018	0.879	0.005	0.851	-0.036	0.795	-0.038	0.732	-0.071	0.779	0.032	0.818	0.02
11	0.905	-0.02	0.868	-0.037	0.838	-0.016	0.776	-0.04	0.709	-0.003	0.762	-0.015	0.805	0.094
12	0.896	-0.018	0.856	0.005	0.823	-0.026	0.758	0.015	0.685	-0.028	0.747	0.05	0.795	0.075
AR Process		1		1		1		1		1		1		1

Table 05: Auto-Correlation Function (ACF) and Partial Auto-Correlation Function (PACF) of the time series variables

Panel 5: OIS curve, spot

	0_5 yr		1 yr		2 yr		5 yr		10 yr		15 yr		20 yr	
	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC
1	0.994	0.994	0.992	0.992	0.989	0.989	0.986	0.986	0.980	0.980	0.970	0.970	0.965	0.965
2	0.987	-0.018	0.984	-0.009	0.979	0.023	0.973	-0.013	0.960	-0.025	0.940	-0.016	0.931	-0.007
3	0.981	-0.014	0.977	-0.005	0.969	-0.003	0.959	0.002	0.940	0.014	0.912	0.006	0.898	-0.006
4	0.974	-0.018	0.969	-0.009	0.959	0.009	0.946	0.003	0.922	0.010	0.885	0.009	0.866	0.007
5	0.967	-0.019	0.961	-0.014	0.949	-0.005	0.933	0.017	0.904	0.007	0.860	0.023	0.838	0.030
6	0.960	-0.013	0.952	-0.011	0.939	-0.021	0.921	0.025	0.888	0.045	0.837	0.024	0.810	-0.006
7	0.953	-0.016	0.944	-0.024	0.929	-0.019	0.909	-0.021	0.873	0.014	0.816	0.025	0.785	0.025
8	0.945	-0.018	0.935	-0.012	0.919	-0.002	0.897	0.007	0.859	0.020	0.798	0.040	0.763	0.047
9	0.938	0.002	0.927	0.023	0.909	0.029	0.886	0.020	0.846	0.026	0.782	0.022	0.743	0.006
10	0.931	-0.008	0.919	-0.013	0.899	-0.013	0.874	-0.030	0.831	-0.053	0.763	-0.053	0.720	-0.048
11	0.923	-0.017	0.910	-0.019	0.889	-0.021	0.862	-0.031	0.815	-0.029	0.741	-0.044	0.694	-0.047
12	0.915	-0.015	0.902	-0.010	0.879	-0.009	0.849	0.003	0.800	0.014	0.722	0.028	0.673	0.051
AR Process		1		1		1		1		1		1		1

Panel 6: OIS curve, forward

	0_5 yr		1 yr		2 yr		5 yr		10 yr		15 yr		20 yr	
	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC
1	0.989	0.989	0.985	0.985	0.984	0.984	0.974	0.974	0.961	0.961	0.967	0.967	0.989	0.989
2	0.977	-0.004	0.971	0.011	0.968	0.023	0.949	-0.010	0.922	-0.014	0.946	0.166	0.976	-0.067
3	0.966	0.000	0.957	0.012	0.954	0.008	0.925	0.018	0.886	0.016	0.925	0.018	0.962	-0.080
4	0.955	-0.008	0.943	0.007	0.939	-0.003	0.901	-0.013	0.852	0.005	0.901	-0.037	0.948	0.037
5	0.943	-0.005	0.931	0.019	0.925	0.019	0.879	0.015	0.815	-0.044	0.876	-0.046	0.932	-0.108
6	0.932	-0.024	0.918	-0.015	0.912	0.008	0.858	0.031	0.784	0.045	0.854	0.012	0.916	-0.009
7	0.919	-0.035	0.904	-0.047	0.898	-0.012	0.840	0.027	0.753	-0.016	0.832	0.011	0.901	0.018
8	0.907	-0.004	0.890	0.021	0.884	-0.003	0.823	0.032	0.728	0.070	0.815	0.063	0.885	-0.016
9	0.896	0.044	0.878	0.039	0.872	0.030	0.807	0.005	0.706	0.029	0.796	0.005	0.870	0.017
10	0.884	-0.029	0.865	-0.038	0.859	-0.040	0.789	-0.047	0.681	-0.052	0.779	0.003	0.855	0.047
11	0.872	-0.025	0.853	-0.008	0.845	-0.008	0.770	-0.017	0.654	-0.042	0.764	0.029	0.843	0.075
12	0.860	-0.004	0.839	-0.017	0.831	-0.037	0.753	0.010	0.626	-0.028	0.751	0.023	0.833	0.052
AR Process		1		1		1		1		1		1		1

Table 05: Auto-Correlation Function (ACF) and Partial Auto-Correlation Function (PACF) of the time series variables

Panel 7: Inflation curve, Spot

	2 yr		5 yr		10 yr		15 yr		20 yr	
	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC
1	0.981	0.981	0.996	0.996	0.995	0.995	0.992	0.992	0.986	0.986
2	0.961	-0.025	0.990	-0.289	0.988	-0.310	0.980	-0.319	0.963	-0.347
3	0.942	0.000	0.983	-0.133	0.978	-0.129	0.964	-0.096	0.935	-0.086
4	0.922	-0.025	0.974	-0.117	0.967	-0.084	0.947	-0.047	0.904	-0.042
5	0.902	0.003	0.964	-0.073	0.955	-0.042	0.929	-0.035	0.871	-0.030
6	0.883	-0.009	0.953	-0.080	0.942	-0.042	0.910	-0.025	0.837	-0.023
7	0.864	0.003	0.941	-0.018	0.928	0.000	0.890	-0.021	0.804	0.019
8	0.845	-0.029	0.928	-0.059	0.914	-0.065	0.869	-0.044	0.770	-0.056
9	0.827	0.044	0.915	0.071	0.899	0.060	0.849	0.021	0.735	-0.028
10	0.811	0.015	0.901	-0.017	0.885	-0.021	0.828	0.023	0.702	0.057
11	0.794	0.000	0.888	0.016	0.870	0.004	0.808	0.001	0.671	0.015
12	0.780	0.022	0.874	0.024	0.856	0.035	0.789	0.041	0.642	0.041
AR Process		1		4		4		3		3

Panel 8: Inflation curve, forward

	2 yr		5 yr		10 yr		15 yr		20 yr	
	AC	PAC	AC	PAC	AC	PAC	AC	PAC	AC	PAC
1	0.980	0.980	0.989	0.989	0.985	0.985	0.990	0.990	0.983	0.983
2	0.960	-0.033	0.970	-0.399	0.962	-0.289	0.974	-0.311	0.955	-0.329
3	0.936	-0.077	0.946	-0.111	0.934	-0.112	0.955	-0.071	0.922	-0.079
4	0.911	-0.056	0.919	-0.025	0.903	-0.063	0.933	-0.065	0.887	-0.012
5	0.887	0.014	0.891	-0.004	0.868	-0.068	0.910	-0.068	0.851	-0.039
6	0.861	-0.038	0.862	-0.031	0.832	-0.055	0.885	-0.026	0.815	0.022
7	0.835	-0.046	0.833	0.042	0.793	-0.040	0.861	0.063	0.781	0.055
8	0.809	0.013	0.805	-0.020	0.754	-0.020	0.837	-0.020	0.749	-0.044
9	0.784	0.016	0.777	-0.016	0.711	-0.113	0.812	-0.057	0.715	-0.081
10	0.761	0.012	0.750	0.050	0.667	-0.023	0.787	0.029	0.681	0.009
11	0.739	0.019	0.723	-0.065	0.623	0.016	0.763	-0.027	0.647	-0.036
12	0.720	0.080	0.698	0.065	0.579	0.014	0.739	0.006	0.615	0.061
AR Process		1		3		2		2		2

Table 06: Unit Root Test for Market Index, Exchange Index, Monetary policy tools and Interest Rates at their Level and First Differences

This table reports Augmented Dickey Fuller test of Unit Roots for Market Index, Exchange Index, Monetary policy tools and various Interest Rates at their Level and First Differences for the overall sample period February 07, 2001 to April 15, 2011 with 2500 daily observations for each of the time series variables. Panel 1 shows the ADF statistics for the LSE Stock market index, Exchange Rate Index, Investment Grade Bond Yields and Non-Investment Grade Bond Yields and Panel 2 presents the test statistics for conventional monetary policy tools: official bank rates, M1, M2, M4, and gilt holding. Panel 3 to Panel 8 provide the ADF results for yields for different maturities for LIBOR swap spots and forwards, OIS overnight swap spots and forwards, and Inflation spots and forwards, respectively. For Augmented Dickey Fuller test, the null Hypothesis in each case is that the variable has unit root. A rejection of the null hypothesis means that the variable is otherwise stationary. Presented p-values are computed according to MacKinnon (1996) one-sided p-values.

Series	Panel 1: Market Index, Exchange Rate Index, Bond Yields					Panel 2: Conventional Monetary Policy Tools			
	Levels		First Diff.			Levels		First Diff.	
	Prob.	Lag	Prob.	Lag		Prob.	Lag	Prob.	Lag
LN_FTSE100	0.508	5	0.000	3	Official Bank Rate		0	0	0
EXGIND	0.062	0	0.000	0	Ln_M1	0.711	0	0.000	1
INV_GRD	0.948	0	0.000	0	Ln_M2	0.590	0	0.000	0
NON_INV_GRD	0.905	0	0.000	0	Ln_M4	0.687	0	0.000	0
					Ln_Gilt_Hldg	0.154	0	0.000	

	Panel 3: LIBOR swap curve, spot				Panel 4: LIBOR swap curve, forward				Panel 5: OIS curve, spot				Panel 6: OIS curve, forward				Panel 7: Inflation curve, Spot				Panel 8: Inflation curve, forward			
	Levels		First Diff.		Levels		First Diff.		Levels		First Diff.		Levels		First Diff.		Levels		First Diff.		Levels		First Diff.	
Series	Prob.	Lag	Prob.	Lag	Prob.	Lag	Prob.	Lag	Prob.	Lag	Prob.	Lag	Prob.	Lag	Prob.	Lag	Prob.	Lag	Prob.	Lag	Prob.	Lag	Prob.	Lag
0_5 yr	0.959	4	0	3	0.971	0	0	0	0.000	0	0	3	0.000	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1_0 yr	0.982	0	0	0	0.936	2	0	1	0.000	0	0	0	0.007	0	0	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2_0 yr	0.959	0	0	0	0.871	0	0	0	0.003	0	0	0	0.300	0	0	0	0.000	0	0	0	0.199	1	0	0
5_0 yr	0.961	0	0	0	0.716	0	0	0	0.098	0	0	0	0.253	0	0	0	0.560	2	0	1	0.073	1	0	0
10_0 yr	0.876	0	0	0	0.003	0	0	0	0.151	0	0	0	0.023	0	0	0	0.516	1	0	0	0.207	1	0	0
15_0 yr	0.700	0	0	0	0.023	0	0	0	0.154	0	0	0	0.192	1	0	0	0.278	1	0	0	0.264	1	0	0
20_0 yr	0.494	0	0	0	0.045	0	0	0	0.132	0	0	0	0.614	0	0	0	0.075	1	0	0	0.18	1	0	0

Table 07: Granger Causality Tests

In Table 07 we report pair-wise Granger Causality analysis for the set of all possible combinations of explanatory variables and different maturities of different types of target interest rates and inflation rates in Panel A through Panel C. In Panel A, we present a pair-wise Granger Causality test among the Monetary Policy tools. In Panel B, we report the same for Monetary Policy Tools and different maturity spot and forward yields. Panel C shows the causal relations across the different maturities of spots and forwards that are the target of the monetary policy tools.

Panel A: Causality among Monetary Policy Tools

	Obs.	F-Stat.	Prob.
LN_M2 does not Granger Cause LN_M1	323	0.031	0.969
LN_M1 does not Granger Cause LN_M2		0.054	0.948
LN_M4 does not Granger Cause LN_M1	323	0.008	0.992
LN_M1 does not Granger Cause LN_M4		1.874	0.155
LN_GILTHLD does not Granger Cause LN_M1	323	0.413	0.662
LN_M1 does not Granger Cause LN_GILTHLD		0.339	0.712
LN_M4 does not Granger Cause LN_M2	323	0.059	0.943
LN_M2 does not Granger Cause LN_M4		0.660	0.518
LN_GILTHLD does not Granger Cause LN_M2	323	0.010	0.990
LN_M2 does not Granger Cause LN_GILTHLD		0.465	0.629
LN_GILTHLD does not Granger Cause LN_M4	323	4.393	0.013
LN_M4 does not Granger Cause LN_GILTHLD		0.208	0.812

Table 07: Granger Causality Tests (continued)

Panel B: Granger Causality between Monetary Policy Tools and different maturity spot and forward yields

		OIS		OIF		LIBORSPOT		LIBORFOR		IS		IF	
Null Hypothesis:	Obs	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.
LN_M1 does not Granger Cause 0_5yr	323	2.407	0.092	1.811	0.165	3.204	0.042	0.450	0.638	--	--	--	--
0_5yr does not Granger Cause LN_M1		0.223	0.800	0.294	0.745	0.036	0.965	0.049	0.952	--	--	--	--
LN_M2 does not Granger Cause 0_5yr	323	0.111	0.895	0.675	0.510	1.856	0.158	3.090	0.047	--	--	--	--
0_5yr does not Granger Cause LN_M2		1.428	0.241	0.996	0.371	0.431	0.650	0.139	0.870	--	--	--	--
LN_M4 does not Granger Cause 0_5yr	323	2.598	0.076	0.605	0.547	2.959	0.053	0.328	0.721	--	--	--	--
0_5yr does not Granger Cause LN_M4		0.011	0.989	0.068	0.934	0.940	0.392	1.236	0.292	--	--	--	--
LN_GILTHLD does not Granger Cause 0_5yr	323	1.112	0.330	0.610	0.544	1.165	0.313	0.330	0.719	--	--	--	--
0_5yr does not Granger Cause LN_GILTHLD		0.892	0.411	1.259	0.285	0.513	0.599	0.468	0.627	--	--	--	--
LN_M1 does not Granger Cause 1yr	323	1.093	0.337	2.661	0.071	0.342	0.711	8.153	0.000	--	--	--	--
1yr does not Granger Cause LN_M1		0.463	0.630	1.096	0.336	0.070	0.933	0.166	0.847	--	--	--	--
LN_M2 does not Granger Cause 1yr	323	0.530	0.589	0.469	0.626	4.782	0.009	3.288	0.039	--	--	--	--
1yr does not Granger Cause LN_M2		1.123	0.327	0.832	0.436	0.344	0.709	0.057	0.944	--	--	--	--
LN_M4 does not Granger Cause 1yr	323	1.604	0.203	4.299	0.014	0.079	0.924	6.640	0.002	--	--	--	--
1yr does not Granger Cause LN_M4		0.106	0.899	0.293	0.746	1.329	0.266	1.730	0.179	--	--	--	--
LN_GILTHLD does not Granger Cause 1yr	323	0.280	0.756	1.859	0.158	0.932	0.395	4.147	0.017	--	--	--	--
1yr does not Granger Cause LN_GILTHLD		1.521	0.220	0.776	0.461	0.442	0.643	0.322	0.725	--	--	--	--

Table 07: Granger Causality Tests (continued)

Panel B: Granger Causality between Monetary Policy Tools and different maturity spot and forward yields

		OIS		OIF		LIBORSPOT		LIBORFOR		IS		IF	
Null Hypothesis:	Obs	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.
LN_M1 does not Granger Cause 2yr	323	3.401	0.035	5.430	0.005	7.668	0.001	4.998	0.007	4.462	0.013	4.274	0.015
2yr does not Granger Cause LN_M1		1.274	0.281	1.445	0.237	0.281	0.755	0.265	0.768	2.465	0.087	2.152	0.118
LN_M2 does not Granger Cause 2yr	323	0.856	0.426	2.507	0.083	2.199	0.113	2.029	0.133	0.333	0.717	1.177	0.310
2yr does not Granger Cause LN_M2		1.115	0.329	0.992	0.372	0.038	0.962	0.219	0.804	0.184	0.832	1.679	0.189
LN_M4 does not Granger Cause 2yr	323	4.734	0.009	6.371	0.002	4.266	0.015	5.934	0.003	0.875	0.418	4.866	0.008
2yr does not Granger Cause LN_M4		0.205	0.815	0.238	0.788	1.831	0.162	0.175	0.840	1.962	0.143	1.261	0.285
LN_GILTHLD does not Granger Cause 2yr	323	2.365	0.096	3.874	0.022	3.262	0.040	3.955	0.020	0.715	0.490	0.430	0.651
2yr does not Granger Cause LN_GILTHLD		0.698	0.498	0.390	0.678	0.095	0.909	0.348	0.706	1.350	0.261	1.800	0.167
LN_M1 does not Granger Cause 5yr	323	5.668	0.004	4.282	0.015	5.600	0.004	2.799	0.062	0.030	0.971	1.134	0.323
5yr does not Granger Cause LN_M1		2.309	0.101	1.641	0.195	0.100	0.905	0.425	0.654	0.290	0.749	0.083	0.921
LN_M2 does not Granger Cause 5yr	323	2.355	0.097	1.476	0.230	5.297	0.006	4.990	0.007	0.171	0.843	0.877	0.417
5yr does not Granger Cause LN_M2		1.176	0.310	0.471	0.625	0.250	0.779	1.042	0.354	0.188	0.828	2.479	0.086
LN_M4 does not Granger Cause 5yr	323	6.225	0.002	4.123	0.017	5.246	0.006	2.493	0.084	0.383	0.683	0.231	0.794
5yr does not Granger Cause LN_M4		0.403	0.669	0.370	0.691	0.199	0.820	0.196	0.822	1.764	0.173	0.603	0.548
LN_GILTHLD does not Granger Cause 5yr	323	3.984	0.020	3.777	0.024	4.457	0.012	2.153	0.118	0.074	0.929	1.478	0.230
5yr does not Granger Cause LN_GILTHLD		0.814	0.444	1.564	0.211	0.976	0.378	3.691	0.026	3.206	0.042	3.430	0.034

Table 07: Granger Causality Tests (continued)

Panel B: Granger Causality between Monetary Policy Tools and different maturity spot and forward yields

		OIS		OIF		LIBORSPOT		LIBORFOR		IS		IF	
Null Hypothesis:	Obs	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.
LN_M1 does not Granger Cause 10yr	323	4.552	0.011	0.686	0.505	3.434	0.034	0.248	0.781	0.068	0.935	1.281	0.279
10yr does not Granger Cause LN_M1		2.420	0.091	2.606	0.075	0.141	0.868	1.247	0.289	0.035	0.966	0.126	0.881
LN_M2 does not Granger Cause 10yr	323	1.478	0.230	0.483	0.617	5.554	0.004	4.681	0.010	0.398	0.672	1.997	0.138
10yr does not Granger Cause LN_M2		0.801	0.450	0.716	0.489	0.541	0.583	0.506	0.604	1.403	0.248	2.976	0.052
LN_M4 does not Granger Cause 10yr	323	4.339	0.014	0.101	0.904	2.825	0.061	0.381	0.684	0.342	0.711	0.042	0.959
10yr does not Granger Cause LN_M4		0.397	0.673	0.521	0.594	0.054	0.947	0.424	0.655	0.865	0.422	0.486	0.616
LN_GILTHLD does not Granger Cause 10yr	323	3.448	0.033	0.711	0.492	2.343	0.098	0.625	0.536	1.009	0.366	2.354	0.097
10yr does not Granger Cause LN_GILTHLD		1.664	0.191	4.368	0.013	3.278	0.039	7.864	0.001	4.625	0.011	3.700	0.026
LN_M1 does not Granger Cause 15yr	323	3.617	0.028	0.089	0.915	1.843	0.160	0.256	0.775	0.150	0.861	4.912	0.008
15yr does not Granger Cause LN_M1		3.053	0.049	1.289	0.277	1.522	0.220	0.655	0.520	0.227	0.797	1.708	0.183
LN_M2 does not Granger Cause 15yr	323	0.844	0.431	0.721	0.487	2.280	0.104	3.277	0.039	0.713	0.491	6.543	0.002
15yr does not Granger Cause LN_M2		1.094	0.336	1.123	0.327	0.401	0.670	0.357	0.700	2.295	0.102	1.562	0.211
LN_M4 does not Granger Cause 15yr	323	3.129	0.045	0.072	0.931	5.546	0.004	0.017	0.983	0.386	0.680	1.076	0.342
15yr does not Granger Cause LN_M4		0.408	0.665	0.051	0.950	0.598	0.550	0.034	0.967	0.328	0.721	0.920	0.399
LN_GILTHLD does not Granger Cause 20yr	323	2.363	0.096	2.025	0.134	1.762	0.173	0.511	0.600	0.714	0.491	8.009	0.000
20yr does not Granger Cause LN_GILTHLD		3.147	0.044	1.353	0.260	0.588	0.556	0.372	0.689	0.641	0.527	1.231	0.293
LN_GILTHLD does not Granger Cause 20yr	323	0.361	0.697	4.034	0.019	5.483	0.005	3.197	0.042	1.270	0.282	4.426	0.013
20yr does not Granger Cause LN_GILTHLD		1.368	0.256	1.116	0.329	0.581	0.560	0.378	0.685	2.193	0.113	0.704	0.495
LN_GILTHLD does not Granger Cause 20yr	323	1.911	0.150	1.359	0.259	1.119	0.328	0.574	0.564	0.079	0.924	3.472	0.032
20yr does not Granger Cause LN_GILTHLD		0.397	0.673	0.358	0.699	0.014	0.986	0.042	0.959	0.089	0.915	0.658	0.519
LN_GILTHLD does not Granger Cause 20yr	323	1.595	0.205	1.453	0.236	0.947	0.389	0.578	0.562	0.449	0.638	4.099	0.018
20yr does not Granger Cause LN_GILTHLD		2.683	0.070	1.833	0.162	4.042	0.019	2.233	0.109	2.195	0.113	0.169	0.845
LN_GILTHLD does not Granger Cause 20yr	323	2.363	0.096	2.025	0.134	1.762	0.173	0.511	0.600	0.714	0.491	8.009	0.000
20yr does not Granger Cause LN_GILTHLD		3.147	0.044	1.353	0.260	0.588	0.556	0.372	0.689	0.641	0.527	1.231	0.293

Table 07: Granger Causality Tests (continued)

Panel C: Granger Causality among different maturity spot and forward yields

		OIS		OIF		LIBORSPOT		LIBORFOR		IS		IF	
Null Hypothesis:	Obs	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.
1yr does not Granger Cause 0_5yr	323	6.177	0.002	0.690	0.502	5.790	0.003	6.041	0.003	--	--	--	--
0_5yr does not Granger Cause 1yr		0.998	0.370	3.971	0.020	8.726	0.000	3.670	0.027	--	--	--	--
5yr does not Granger Cause 0_5yr	323	3.247	0.040	0.138	0.871	4.644	0.010	2.492	0.084	--	--	--	--
0_5yr does not Granger Cause 5yr		1.560	0.212	0.004	0.996	2.006	0.136	1.414	0.245	--	--	--	--
10yr does not Granger Cause 0_5yr	323	1.749	0.176	2.710	0.068	3.419	0.034	0.877	0.417	--	--	--	--
0_5yr does not Granger Cause 10yr		0.976	0.378	0.305	0.737	1.137	0.322	1.473	0.231	--	--	--	--
15yr does not Granger Cause 0_5yr	323	1.352	0.260	2.021	0.134	2.302	0.102	0.229	0.796	--	--	--	--
0_5yr does not Granger Cause 15yr		0.979	0.377	0.020	0.980	0.690	0.503	0.398	0.672	--	--	--	--
2yr does not Granger Cause 0_5yr	323	4.736	0.009	0.158	0.854	5.085	0.007	2.420	0.091	--	--	--	--
0_5yr does not Granger Cause 2yr		3.137	0.045	1.658	0.192	3.252	0.040	5.137	0.006	--	--	--	--
20yr does not Granger Cause 0_5yr	323	0.995	0.371	1.687	0.187	1.755	0.175	0.210	0.811	--	--	--	--
yr0_5 does not Granger Cause 20yr		0.636	0.530	0.463	0.630	0.628	0.534	0.241	0.786	--	--	--	--
5yr does not Granger Cause 1yr	323	3.688	0.026	2.045	0.131	2.925	0.055	0.039	0.962	--	--	--	--
1yr does not Granger Cause 5yr		3.740	0.025	1.060	0.348	1.883	0.154	0.540	0.583	--	--	--	--
10yr does not Granger Cause 1yr	323	4.607	0.011	1.707	0.183	2.381	0.094	0.695	0.500	--	--	--	--
1yr does not Granger Cause 10yr		0.352	0.704	0.455	0.635	1.517	0.221	0.793	0.453	--	--	--	--
15yr does not Granger Cause 1yr	323	4.888	0.008	0.119	0.888	1.925	0.148	0.150	0.861	--	--	--	--
1yr does not Granger Cause 15yr		0.219	0.803	0.141	0.868	1.053	0.350	0.098	0.906	--	--	--	--
2yr does not Granger Cause 1yr	323	3.192	0.042	10.177	0.000	2.689	0.070	0.626	0.535	--	--	--	--
1yr does not Granger Cause 2yr		5.766	0.004	5.897	0.003	14.193	0.000	9.976	0.000	--	--	--	--
20yr does not Granger Cause 1yr	323	4.270	0.015	1.480	0.229	1.784	0.170	1.594	0.205	--	--	--	--
1yr does not Granger Cause 20yr		0.139	0.871	0.931	0.395	0.884	0.414	0.575	0.563	--	--	--	--

Table 07: Granger Causality Tests (continued)

Panel C: Granger Causality among different maturity spot and forward yields

		OIS		OIF		LIBORSPOT		LIBORFOR		IS		IF	
Null Hypothesis:	Obs	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.	F-Stat.	Prob.
10yr does not Granger Cause 5yr	323	1.392	0.250	2.782	0.063	2.040	0.132	1.521	0.220	2.299	0.102	3.434	0.033
5yr does not Granger Cause 10yr		6.532	0.002	3.084	0.047	2.852	0.059	0.835	0.435	0.646	0.525	0.428	0.652
15yr does not Granger Cause 5yr	323	1.179	0.309	2.111	0.123	1.367	0.256	0.194	0.824	3.438	0.033	3.491	0.032
5yr does not Granger Cause 15yr		2.232	0.109	2.825	0.061	4.008	0.019	2.623	0.074	0.940	0.392	1.801	0.167
2yr does not Granger Cause 5yr	323	1.638	0.196	9.811	0.000	0.896	0.409	7.156	0.001	2.362	0.096	0.392	0.676
5yr does not Granger Cause 2yr		5.014	0.007	5.514	0.004	11.199	0.000	1.776	0.171	0.963	0.383	1.307	0.273
20yr does not Granger Cause 5yr	323	1.979	0.140	3.953	0.020	1.404	0.247	1.444	0.237	3.267	0.039	2.157	0.117
5yr does not Granger Cause 20yr		1.777	0.171	0.664	0.516	1.299	0.274	1.452	0.236	0.800	0.450	2.783	0.063
15yr does not Granger Cause 10yr	323	2.313	0.101	4.767	0.009	1.110	0.331	0.643	0.526	4.975	0.008	1.776	0.171
10yr does not Granger Cause 15yr		1.589	0.206	20.952	0.000	1.701	0.184	2.460	0.087	0.618	0.540	1.374	0.255
2yr does not Granger Cause 10yr	323	1.799	0.167	0.342	0.710	0.962	0.383	0.368	0.692	1.066	0.346	0.300	0.741
10yr does not Granger Cause 2yr		0.976	0.378	0.387	0.679	3.083	0.047	1.418	0.244	0.599	0.550	1.849	0.160
20yr does not Granger Cause 10yr	323	2.466	0.087	0.064	0.938	1.000	0.369	0.232	0.793	3.726	0.025	0.409	0.665
10yr does not Granger Cause 20yr		3.174	0.043	0.150	0.861	1.715	0.182	5.158	0.006	0.040	0.961	0.959	0.385
2yr does not Granger Cause 15yr	323	0.721	0.487	0.111	0.895	0.631	0.533	0.611	0.544	1.261	0.285	2.020	0.135
15yr does not Granger Cause 2yr		0.459	0.632	2.049	0.131	2.033	0.133	1.450	0.236	0.185	0.831	3.334	0.037
20yr does not Granger Cause 15yr	323	3.564	0.030	7.602	0.001	0.811	0.445	1.115	0.329	2.854	0.059	0.330	0.719
15yr does not Granger Cause 20yr		3.881	0.022	0.552	0.576	1.608	0.202	1.406	0.247	0.113	0.894	0.657	0.519
20yr does not Granger Cause 2yr	323	0.229	0.796	3.462	0.033	1.396	0.249	1.063	0.347	0.344	0.709	4.854	0.009
2yr does not Granger Cause 20yr		0.734	0.481	1.150	0.318	0.690	0.503	1.252	0.287	0.825	0.439	5.084	0.007

Table 08: Pedroni (2004) Panel Co-Integration Tests

In Table 08, we report Pedroni (2004) Panel Co-integration Tests for the a) overall period, b) QE (a) period (with conventional monetary tools) and c) QE (b) (with both conventional and unconventional tools) for seven different sets of variables in Panel 01 through Panel 08. For the first two sets, the structural equation or mean equation considers the target variables as dependent and only conventional monetary policy tools as exogenous variables. The third set includes both conventional and unconventional monetary policy tools as exogenous variables in the mean equation. Pedroni (2004) argues that in case of shortened time series variables, drawing more cross-sections of a similar nature may be used to reduce short series inconsistencies of traditional co-integration tests.

	Panel 1: Market Index, Exchange Rate Index, Bond Yields											
	Overall Period				QE Period (a)				QE Period (b)			
	Stat.	Prob.	Wght. Stat.	Prob.	Stat.	Prob.	Wght. Stat.	Prob.	Stat.	Prob.	Wght. Stat.	Prob.
Panel v-Stat.	-1.4576	0.1379	-0.8326	0.2821	-1.8842	0.0676	-1.1725	0.2006	-2.1843	0.0367	-1.5244	0.1248
Panel rho-Stat.	-91.4862	0.0000	-60.3570	0.0000	-66.2637	0.0000	-42.4792	0.0000	-59.7323	0.0000	-37.4440	0.0000
Panel PP-Stat.	-31.9860	0.0000	-24.9759	0.0000	-29.4927	0.0000	-22.5268	0.0000	-29.5775	0.0000	-22.2044	0.0000
Panel ADF-Stat.	-14.5246	0.0000	-10.1753	0.0000	-16.3467	0.0000	-10.4645	0.0000	-16.0823	0.0000	-9.9206	0.0000
Group rho-Stat.	-33.5547	0.0000			-19.1475	0.0000			-16.7179	0.0000		
Group PP-Stat.	-12.2698	0.0000			-8.7833	0.0000			-8.0901	0.0000		
Group ADF-Stat.	-6.2400	0.0000			-4.5462	0.0000			-3.9412	0.0002		
	Panel 2: LIBOR swap curve, spot											
Panel v-Stat.	4.1867	0.0001	3.9727	0.0001	4.1867	0.0001	3.9727	0.0001	3.0615	0.0037	2.9162	0.0057
Panel rho-Stat.	-7.5889	0.0000	-8.6118	0.0000	-7.5889	0.0000	-8.6118	0.0000	-6.4453	0.0000	-7.3855	0.0000
Panel PP-Stat.	-5.9714	0.0000	-6.7330	0.0000	-5.9714	0.0000	-6.7330	0.0000	-5.5141	0.0000	-6.3072	0.0000
Panel ADF-Stat.	-5.7376	0.0000	-5.8721	0.0000	-5.7376	0.0000	-5.8721	0.0000	-5.0658	0.0000	-5.3121	0.0000
Group rho-Stat.	-8.5953	0.0000			-8.5953	0.0000			-7.1139	0.0000		
Group PP-Stat.	-7.5175	0.0000			-7.5175	0.0000			-6.7632	0.0000		
Group ADF-Stat.	-6.3617	0.0000			-6.3617	0.0000			-5.6023	0.0000		
	Panel 3: LIBOR swap curve, forward											
Panel v-Stat.	3.3685	0.0014	3.6776	0.0005	3.3685	0.0014	3.6776	0.0005	2.4159	0.0216	2.6592	0.0116
Panel rho-Stat.	-5.8469	0.0000	-7.1714	0.0000	-5.8469	0.0000	-7.1714	0.0000	-4.8262	0.0000	-5.8904	0.0000
Panel PP-Stat.	-4.8497	0.0000	-5.8476	0.0000	-4.8497	0.0000	-5.8476	0.0000	-4.3686	0.0000	-5.2898	0.0000
Panel ADF-Stat.	-4.9646	0.0000	-5.6488	0.0000	-4.9646	0.0000	-5.6488	0.0000	-4.3023	0.0000	-5.0483	0.0000
Group rho-Stat.	-7.2908	0.0000			-7.2908	0.0000			-5.7323	0.0000		
Group PP-Stat.	-6.5728	0.0000			-6.5728	0.0000			-5.7208	0.0000		
Group ADF-Stat.	-6.2457	0.0000			-6.2457	0.0000			-5.4401	0.0000		
	Panel 4: OIS curve, spot											
Panel v-Stat.	2.4924	0.0179	3.4043	0.0012	2.4924	0.0179	3.4043	0.0012	1.5937	0.1120	2.4068	0.0220
Panel rho-Stat.	-2.5178	0.0168	-3.9941	0.0001	-2.5178	0.0168	-3.9941	0.0001	-1.6164	0.1080	-2.9435	0.0052
Panel PP-Stat.	-2.4035	0.0222	-3.6971	0.0004	-2.4035	0.0222	-3.6971	0.0004	-1.7764	0.0824	-3.0894	0.0034
Panel ADF-Stat.	-1.7100	0.0925	-2.7067	0.0102	-1.7100	0.0925	-2.7067	0.0102	-0.9072	0.2644	-2.0213	0.0517
Group rho-Stat.	-5.9465	0.0000			-5.9465	0.0000			-4.6791	0.0000		
Group PP-Stat.	-5.4344	0.0000			-5.4344	0.0000			-4.7195	0.0000		
Group ADF-Stat.	2.4924	0.0179			2.4924	0.0179			1.5937	0.1120		

Table 08: Pedroni (2004) Panel Co-Integration Tests (continued ..)

Panel 5: OIS curve, forward												
Panel v-Stat.	1.9011	0.0655	2.4182	0.0214	0.8011	0.2894	1.6107	0.1090	0.0842	0.3975	0.8293	0.2829
Panel rho-Stat.	-2.5047	0.0173	-2.7532	0.0090	-0.1326	0.3955	-1.6010	0.1107	0.6373	0.3256	-0.7126	0.3095
Panel PP-Stat.	-2.0188	0.0520	-2.3072	0.0279	-0.2335	0.3882	-1.7497	0.0863	0.4808	0.3554	-1.0671	0.2258
Panel ADF-Stat.	-1.8359	0.0740	-2.1490	0.0396	0.3201	0.3790	-1.0530	0.2292	1.1859	0.1975	-0.2717	0.3845
Group rho-Stat.	-2.5186	0.0167			-5.0639	0.0000			-3.8357	0.0003		
Group PP-Stat.	-2.3683	0.0242			-4.4442	0.0000			-3.6868	0.0004		
Group ADF-Stat.	-2.1578	0.0389			-3.4544	0.0010			-2.6864	0.0108		
Panel 6: Inflation curve, Spot												
Panel v-Stat.	0.5198	0.3485	0.5211	0.3483	0.5198	0.3485	0.5211	0.3483	-0.0849	0.3975	-0.0836	0.3975
Panel rho-Stat.	1.1619	0.2031	1.1826	0.1982	1.1619	0.2031	1.1826	0.1982	1.8289	0.0749	1.8450	0.0727
Panel PP-Stat.	-0.0991	0.3970	-0.0489	0.3985	-0.0991	0.3970	-0.0489	0.3985	0.6269	0.3278	0.6747	0.3177
Panel ADF-Stat.	0.1129	0.3964	0.1543	0.3942	0.1129	0.3964	0.1543	0.3942	0.9282	0.2593	0.9788	0.2471
Group rho-Stat.	1.8523	0.0718			1.8523	0.0718			2.5797	0.0143		
Group PP-Stat.	0.2967	0.3818			0.2967	0.3818			1.1447	0.2072		
Group ADF-Stat.	0.3251	0.3784			0.3251	0.3784			1.2283	0.1876		
Panel 7: Inflation curve, forward												
Panel v-Stat.	0.9387	0.2568	1.1127	0.2148	-0.5145	0.3495	-0.2099	0.3903	-1.0130	0.2388	-0.7434	0.3026
Panel rho-Stat.	0.7126	0.3095	0.4151	0.3660	1.6337	0.1050	1.0729	0.2244	2.2050	0.0351	1.6674	0.0994
Panel PP-Stat.	0.8618	0.2752	0.5065	0.3509	1.6160	0.1081	0.5386	0.3451	2.3282	0.0265	1.1875	0.1971
Panel ADF-Stat.	1.3152	0.1680	1.2024	0.1936	1.7370	0.0883	0.9478	0.2546	2.4419	0.0202	1.6890	0.0958
Group rho-Stat.	1.2492	0.1828			2.0279	0.0510			2.6293	0.0126		
Group PP-Stat.	1.2017	0.1938			1.2587	0.1807			1.9826	0.0559		
Group ADF-Stat.	1.9374	0.0611			1.5292	0.1239			2.4020	0.0223		
Panel 8: All Spots and Forwards												
Panel v-Stat.	3.2245	0.0022	6.7426	0.0000	-0.7794	0.2944	4.1554	0.0001	-2.2155	0.0343	2.2371	0.0327
Panel rho-Stat.	1.2630	0.1797	-6.4310	0.0000	3.9422	0.0002	-5.8235	0.0000	5.5558	0.0000	-3.6354	0.0005
Panel PP-Stat.	1.6875	0.0961	-5.4716	0.0000	3.5657	0.0007	-6.2313	0.0000	5.4979	0.0000	-4.7285	0.0000
Panel ADF-Stat.	2.6864	0.0108	-4.7330	0.0000	3.9806	0.0001	-4.5172	0.0000	5.9409	0.0000	-2.8377	0.0071
Group rho-Stat.	-6.5863	0.0000			-10.1811	0.0000			-7.3397	0.0000		
Group PP-Stat.	-5.6834	0.0000			-9.4907	0.0000			-7.6159	0.0000		
Group ADF-Stat.	-4.9118	0.0000			-7.7449	0.0000			-5.7852	0.0000		